

KYRENE SCHOOL DISTRICT
COOLING TOWER REPLACEMENT
FOR
KYRENE
de los LAGOS ELEMENTARY SCHOOL



KYRENE de los LAGOS ELEMENTARY SCHOOL
17001 S. 34TH WAY
PHOENIX, ARIZONA 85048

MECHANICAL AND ELECTRICAL ENGINEERS:



LSW ENGINEERS ARIZONA, INCORPORATED
2333 WEST NORTHERN AVENUE
PHOENIX, ARIZONA 85021
(602) 249-1320

STRUCTURAL ENGINEERS:

GERVASIO AND ASSOCIATES, INC.
77 E. THOMAS ROAD, STE 120
PHOENIX, ARIZONA 850152
(602) 285-1720

CODE DATA

CITY OF PHOENIX CODES
2006 PHOENIX BUILDING CODE
2006 PHOENIX RESIDENTIAL CODE
2006 PHOENIX EXISTING BUILDING CODE
2006 PHOENIX ENERGY CONSERVATION CODE
2006 PHOENIX MECHANICAL CODE
2006 PHOENIX FUEL GAS CODE
2006 PHOENIX FIRE CODE
2006 PHOENIX PERFORMANCE CODE
2008 NATIONAL ELECTRICAL CODE/NFPA-70 WITH PHOENIX AMENDMENTS
2006 UNIFORM PLUMBING CODE WITH PHOENIX AMENDMENTS (148KB), 1 TABLE 11-1
2007 ASME A17.1 SAFETY CODE FOR ELEVATORS AND ESCALATORS WITH PHOENIX AMENDMENTS
2007 ASME A17.7 PERFORMANCE-BASED SAFETY CODE FOR ELEVATORS AND ESCALATORS
2002 ASME A17.3 SAFETY CODE FOR EXISTING ELEVATORS AND ESCALATORS WITH PHOENIX AMENDMENTS
2008 ASME A18.1 SAFETY CODE FOR PLATFORM LIFTS AND STAIRWAY CHAIRLIFTS

SHEET INDEX

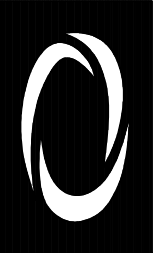
CS	COVER SHEET
M-1	DEMOLITION FLOOR PLAN
M-2	NEW FLOOR PLAN AND DIAGRAM
M-3	LEGEND, SCHEDULES AND DETAILS
M-4	DETAILS
E-1	ELECTRICAL SYMBOLS LIST AND NOTES
E-2	ELECTRICAL SITE PLAN
E-3	ELECTRICAL DEMOLITION FLOOR PLAN
E-4	NEW ELECTRICAL FLOOR PLAN
E-5	ONE LINE DIAGRAM
S-1	PARTIAL FOUNDATION PLAN

SCOPE OF WORK

- BASE BID**
- Remove and replace the existing cooling towers, tower supports, floor sink, etc.
 - Install new galvanized cooling towers, structural tower supports, floor sink, etc. Reconfigure and reconnect the existing condenser water piping to the new towers (provide new BFV's at the towers), provide new tower drains and overflows, reconnect the existing water make-up, electrical and controls.
- ALTERNATE #1 BID**
- Also remove and replace the pumps, piping, water treatment, floor sink, etc.
 - Install new stainless steel cooling towers, pumps, piping, valves, VFD's, water treatment, heat exchanger, tower filters, new tower water make-up, floor sink, electrical, controls, etc.
 - All work indicated on these mechanical and electrical drawings.

REV.	DATE	DESCRIPTION	BY

LSW Engineers
ARIZONA INCORPORATED



2333 West Northern Avenue
Phoenix, Arizona 85021
Telephone: 602.249.1320
Facsimile: 602.336.3276
E-Mail: lswphx@lswphx.com

COVER SHEET

KYRENE de los LAGOS
ELEMENTARY SCHOOL

17001 S. 34TH WAY PHOENIX, ARIZONA 85048

DR. BY
LRW

DES. BY
LAM

CHK. BY
LAM/RAB

DATE
02/17/12

JOB NO.
2011-097.000

SHEET NO.
CS
OF

ELECTRICAL SYMBOLS LIST

- WEATHERPROOF

ONE LINE SYMBOLS

- ERAGE

GENERAL NOTES

ELECTRICAL SYMBOLS AND NOTES

**KYRENE de los LAGOS
ELEMENTARY SCHOOL**

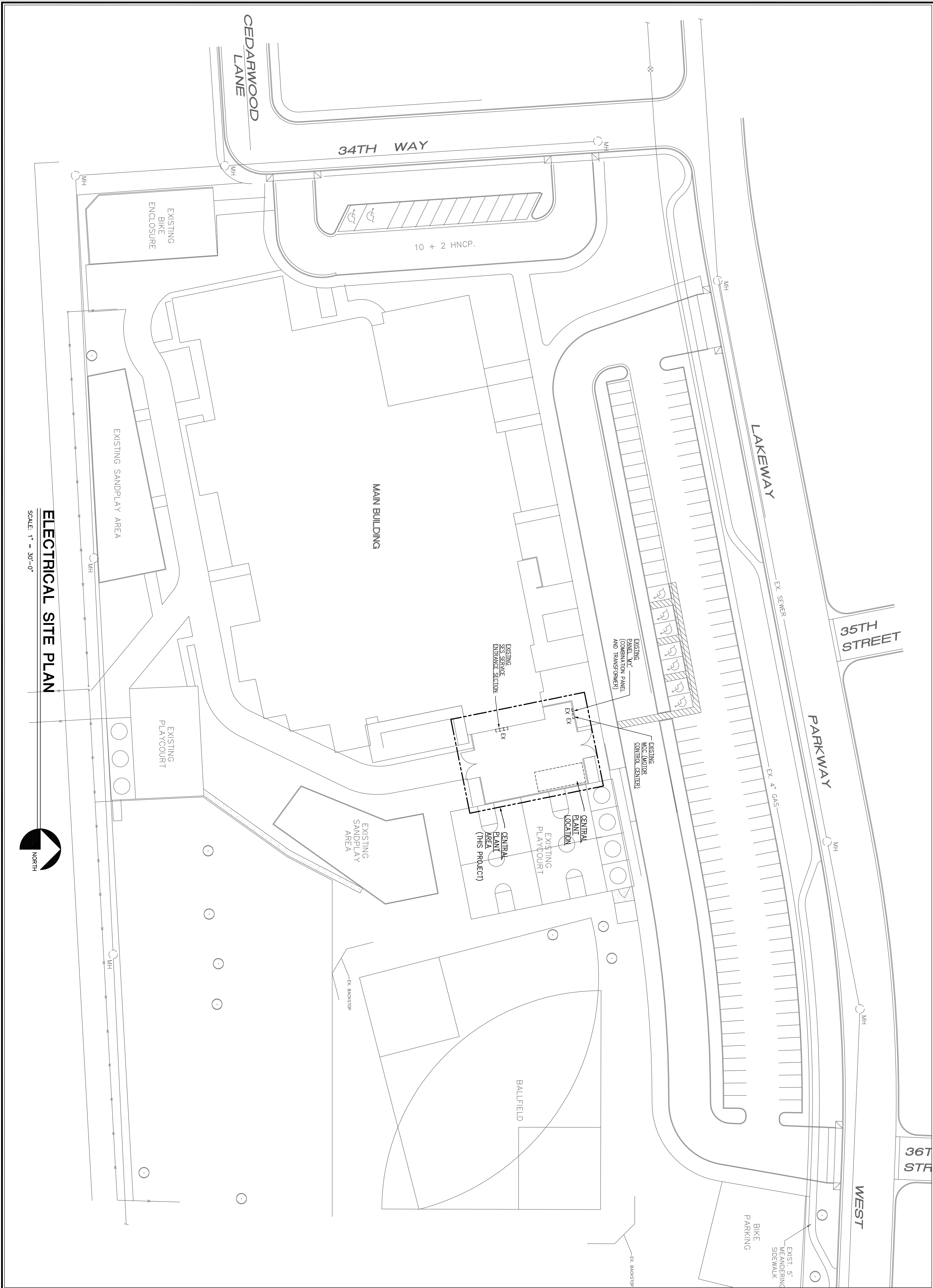
17001 S. 34TH WAY

PHOENIX, ARIZONA 85048



LSW Engineers
ARIZONA INCORPORATED

2333 West Northern Avenue
Phoenix, Arizona 85021
Telephone: 602.249.1320
Facsimile: 602.336.3276
E-Mail: lswwphx@lswwphx.com



ELECTRICAL SITE PLAN		LSW Engineers ARIZONA INCORPORATED		REV.	DATE	DESCRIPTION	BY
KYRENE de los LAGOS ELEMENTARY SCHOOL		2333 West Northern Avenue Phoenix, Arizona 85021 Telephone:602.249.1320 Facsimile: 602.336.3276 E-Mail: lswphx@lswphx.com					
17001 S. 34TH WAY		PHOENIX, ARIZONA 85048					

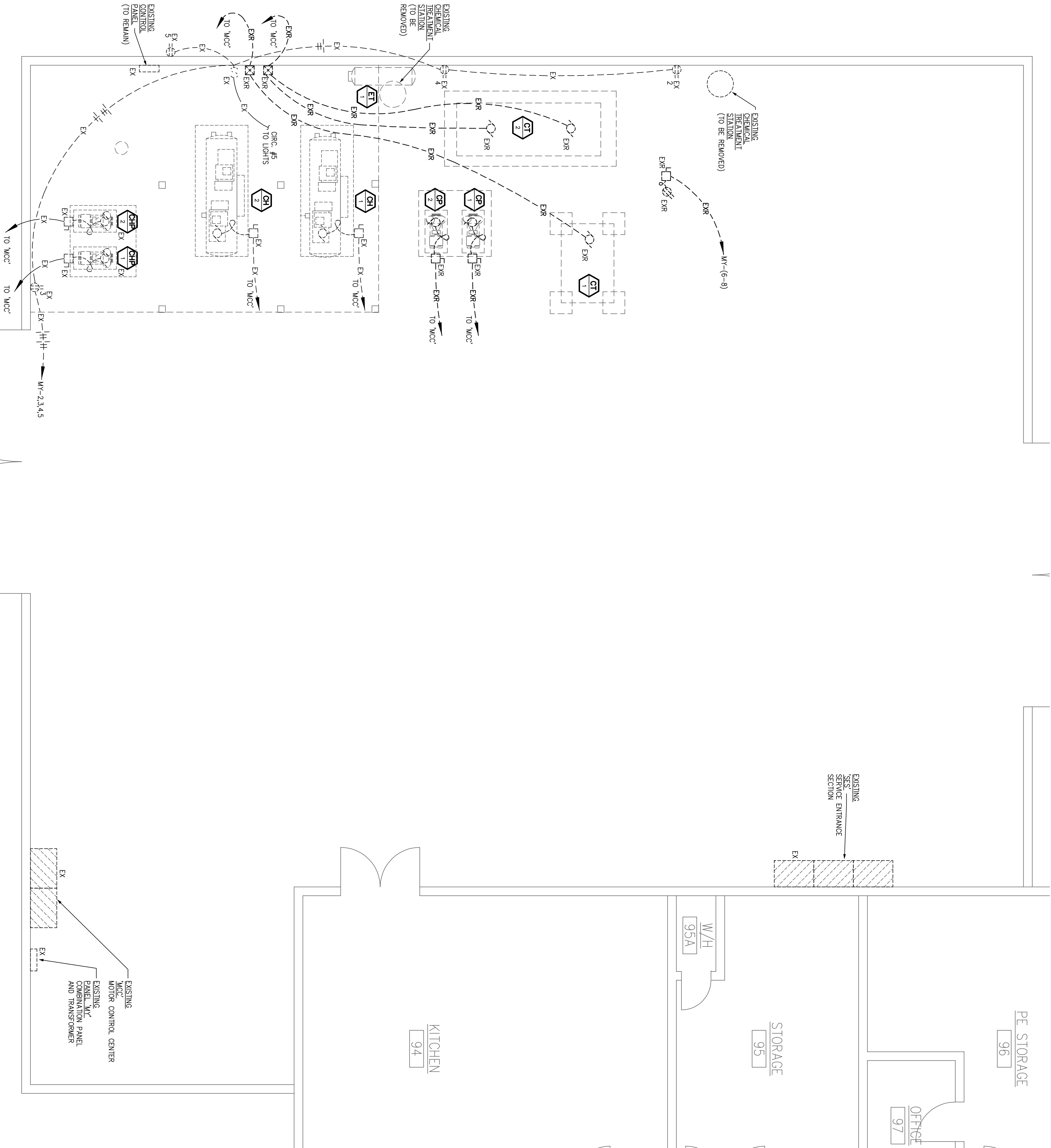
DR. BY	DES. BY	DWG. BY
DL	JGE	CEK
DATE	JOB NO.	
02/17/12	2011-097.000	

REGISTERED PROFESSIONAL ENGINEER STATE OF ARIZONA KATHARASZ 02-21-344 EXPIRES 09/30/14
--

E-2	SHEET NO.
OF	

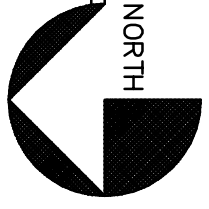
GENERAL NOTES

1. SEE DRAWING E-1 FOR REMODELING NOTES.



ELECTRICAL DEMOLITION FLOOR PLAN

SCALE: 1/4" = 1'-0"



REV.	DATE	DESCRIPTION	BY



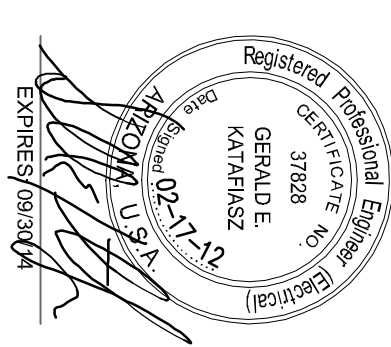
LSW Engineers
ARIZONA INCORPORATED

2333 West Northern Avenue
Phoenix, Arizona 85021
Telephone: 602.249.1320
Facsimile: 602.336.3276
E-Mail: lswphx@lswphx.com

ELECTRICAL DEMOLITION FLOOR PLAN

KYRENE de los LAGOS
ELEMENTARY SCHOOL

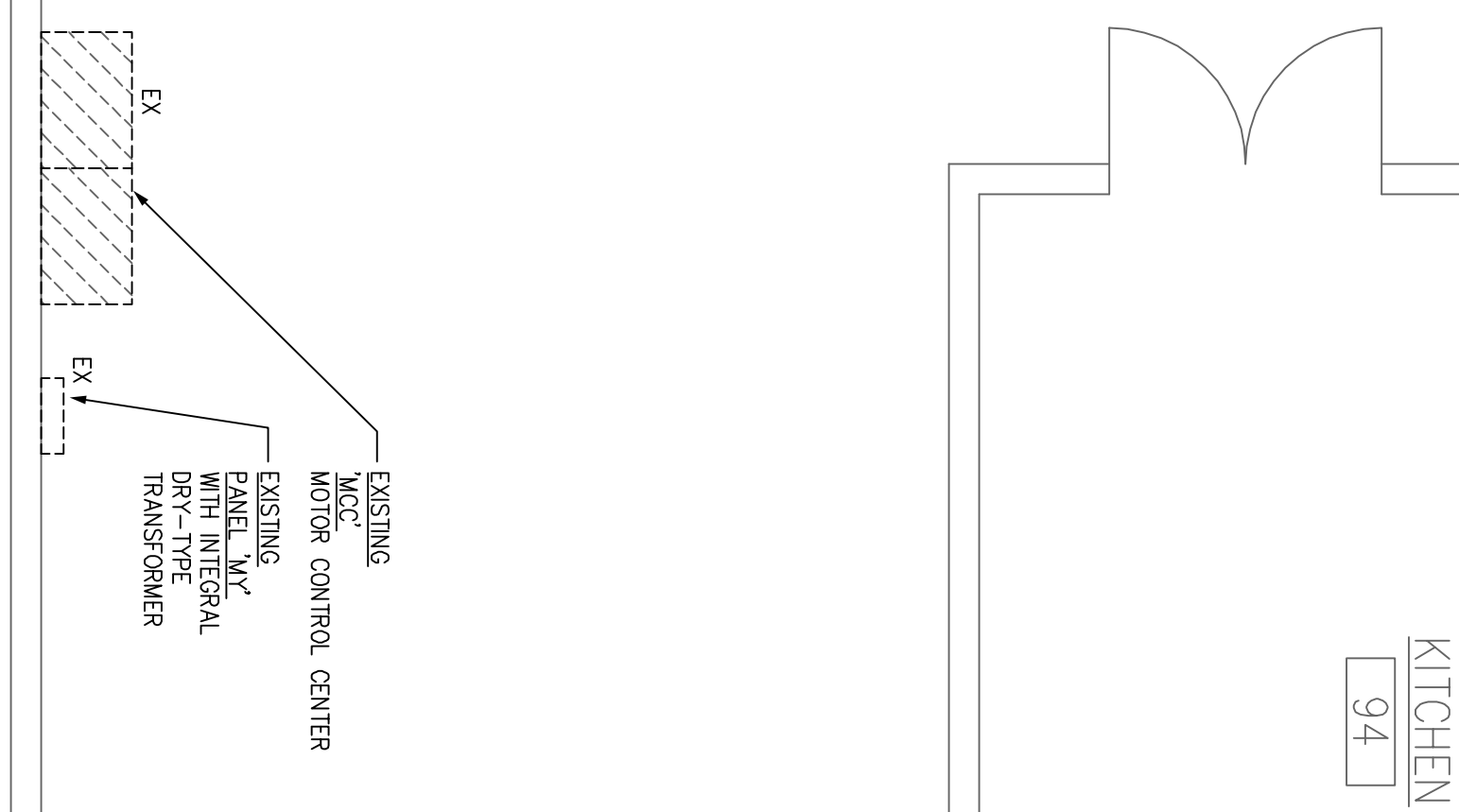
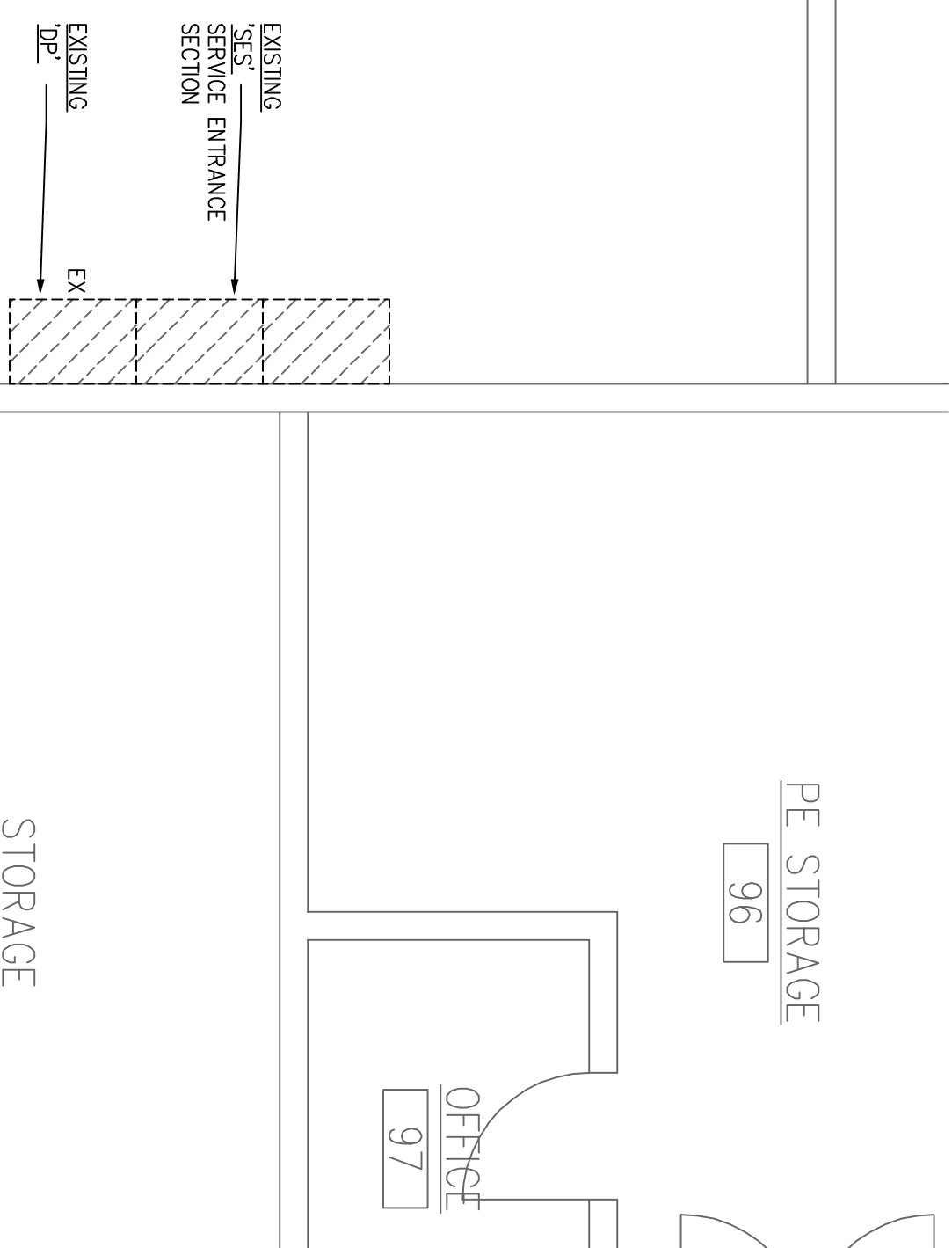
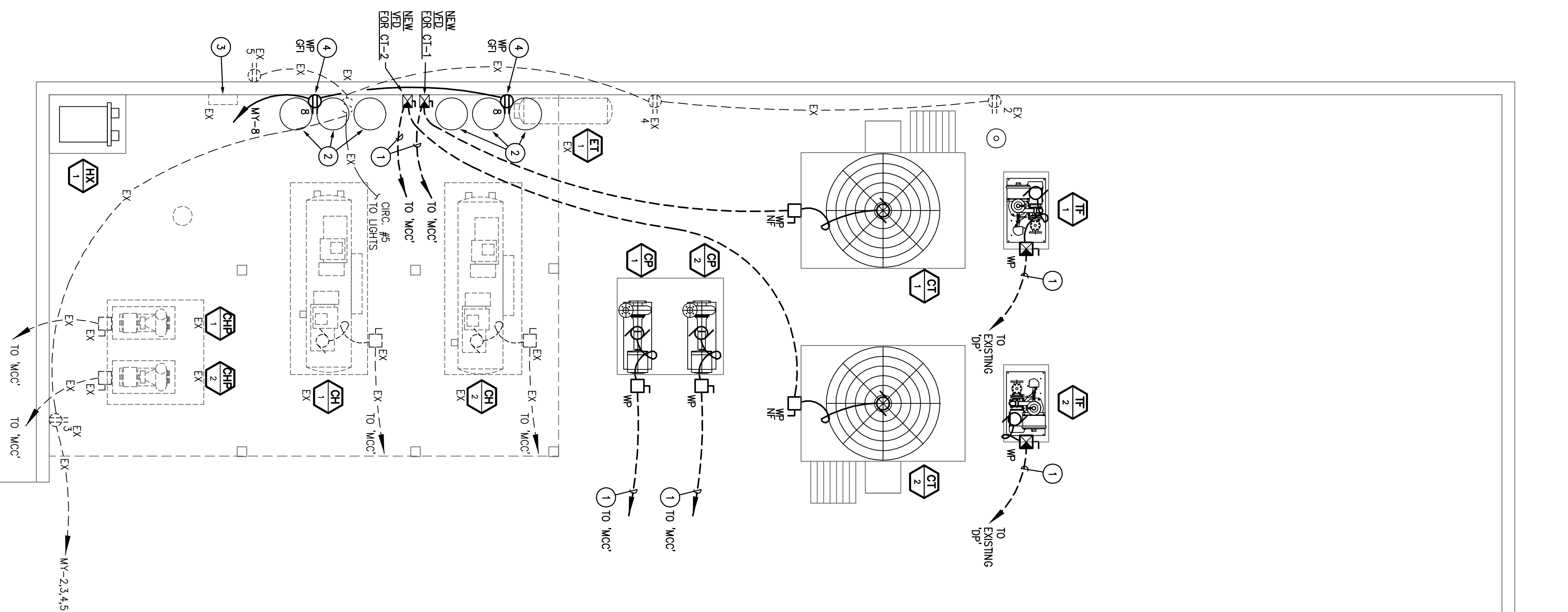
17001 S. 34TH WAY PHOENIX, ARIZONA 85048



Register Professional Engineer
Gerald K. Karpasz
No. 37708
State of Arizona
Expires 02-21-2012

DR. BY	DES. BY	DWG. BY
DL	JGE	GEK
DATE	JOB NO.	
02/17/12	2011-097.000	

SHEET NO.
E-3
OF



KEYED NOTES (#)

1. NEW UNDERGROUND FEEDER IN NEW CONDUIT. REFER TO ONE LINE DIAGRAM DRAWING E-5 FOR MORE INFORMATION.
2. NEW CHEMICAL TREATMENT STATION.
3. EXISTING CONTROL PANEL TO REMAIN.
4. RECEPTACLE FOR CHEMICAL SYSTEM TREATMENT CONTROLLER.

[illegible]

LSW Engineers
ARIZONA INCORPORATED

2333 West Northern Avenue
Phoenix, Arizona 85021
Telephone: 602.249.1320
Facsimile: 602.336.3276
E-Mail: lswpbx@lswpbx.com

NEW ELECTRICAL FLOOR PLAN

**KYRENE de los LAGOS
ELEMENTARY SCHOOL**

17001 S. 34TH WAY PHOENIX, ARIZONA 85048

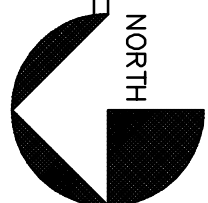
EXISTING										10,000 AIC RATED C/B/s	
PANEL	WY	TYPE	MOUNTING	SURFACE	50A PRIMARY	50A SECONDARY	50A MOB	10,000 AIC RATED C/B/s			
USE AND/OR EXISTING LOAD	AREA SERVED	C/B NO.	Ø A	LOAD	Ø B	NO.	C/B	USE AND/OR AREA SERVED			
		20	1	500	180	2	20	EXISTING LOAD			
		3		1000	180	4					
		5		600	180	6					
		7			200	8					
					1000			SPARE			
								NEW CHEM TREATMENT REC.			
		9				10					
		11				12					
						13					
						14					
						15					
						16					
						17					
						18					
		19				20					
						22					
						23					
		25				24					
		26				26					
		27				28					
		29				30					
						31					
						32					
						33					
						34					
						35					
						36					
						37					
						38					
						39					
						40					
						41					
						42					
						43					
						44					
						45					
						46					
						47					
						48					
						49					
						50					
						51					
						52					
						53					
						54					
						55					
						56					
						57					
						58					
						59					
						60					
						61					
						62					
						63					
						64					
						65					
						66					
						67					
						68					
						69					
						70					
						71					
						72					
						73					
						74					
						75					
						76					
						77					
						78					
						79					
						80					
						81					
						82					
						83					
						84					
						85					
						86					
						87					
						88					
						89					
						90					
						91					
						92					
						93					
						94					
						95					
						96					
						97					
						98					
						99					
						100					
						101					
						102					
						103					
						104					
						105					
						106					
						107					
						108					
						109					
						110					
						111					
						112					
						113					
						114					
						115					
						116					
						117					
						118					
						119					
						120					
						121					
						122					
						123					
						124					
						125					
						126					
						127					
						128					
						129					
						130					
						131					
						132					
						133					
						134					
						135					
						136					
						137					
						138					
						139					
						140					
						141					
						142					
						143					
						144					
						145					
						146					
						147					
						148					
						149					
						150					
						151					
						152					
						153					
						154					
						155					
						156					
						157					
						158					
						159					
						160					
						161					
						162					
						163					
						164					
						165					
						166					
						167					
						168					
						169					
						170					
						171					
						172					
						173					
						174					
						175					
						176					
						177					
						178					
						179					
						180					
						181					
						182					
						183					
						184					
						185					
						186					
						187					
						188					
						189					
						190					
						191					
						192					
						193					
						194					
						195					
						196					
						197					
						198					
						199					
						200					
						201					
						202					
						203					
						204					
						205					
						206					
						207					
						208					
						209					
						210					
						211					
						212					
						213					
						214					
						215					
						216					
						217					
						218					
						219					
						220					
						221					
						222					
						223					
						224					
						225					
						226					
						227					
						228					
						229					
						230					
						231					
						232					
						233					
						234					
						235					
						236					
						237					
						238					
						239					
						240					
						241					
						242					
						243					
						244					
						245					
						246					
						247					
						248					

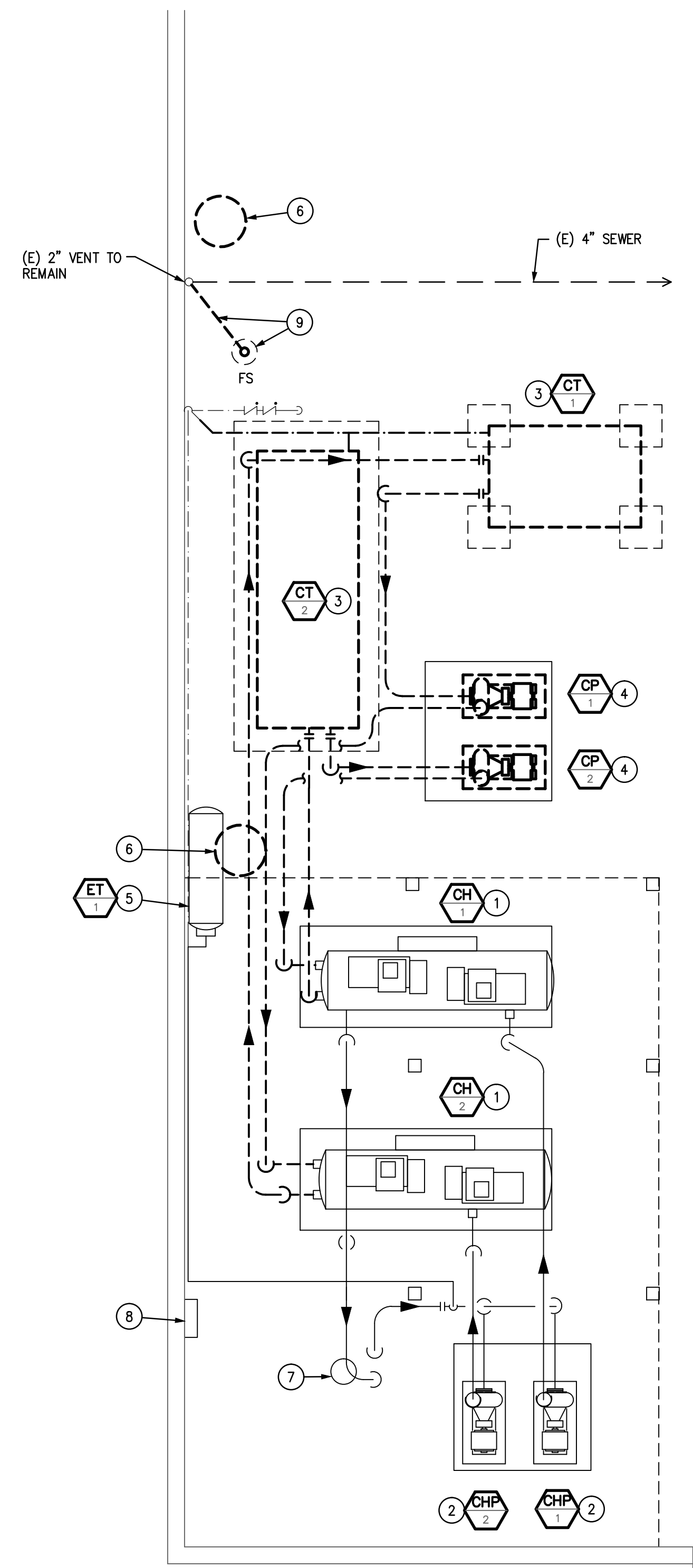
PANEL KEYED NOTES (#)

1. EXISTING CIRCUIT BREAKER, EXISTING LOAD.
2. REMOVE EXISTING (1) 20A, 2-POLE CIRCUIT BREAKER AND PROVIDE NEW (2) 20A, 1-POLE CIRCUIT BREAKERS, TYPE TO MATCH EXISTING.

NEW ELECTRICAL FLOOR PLAN

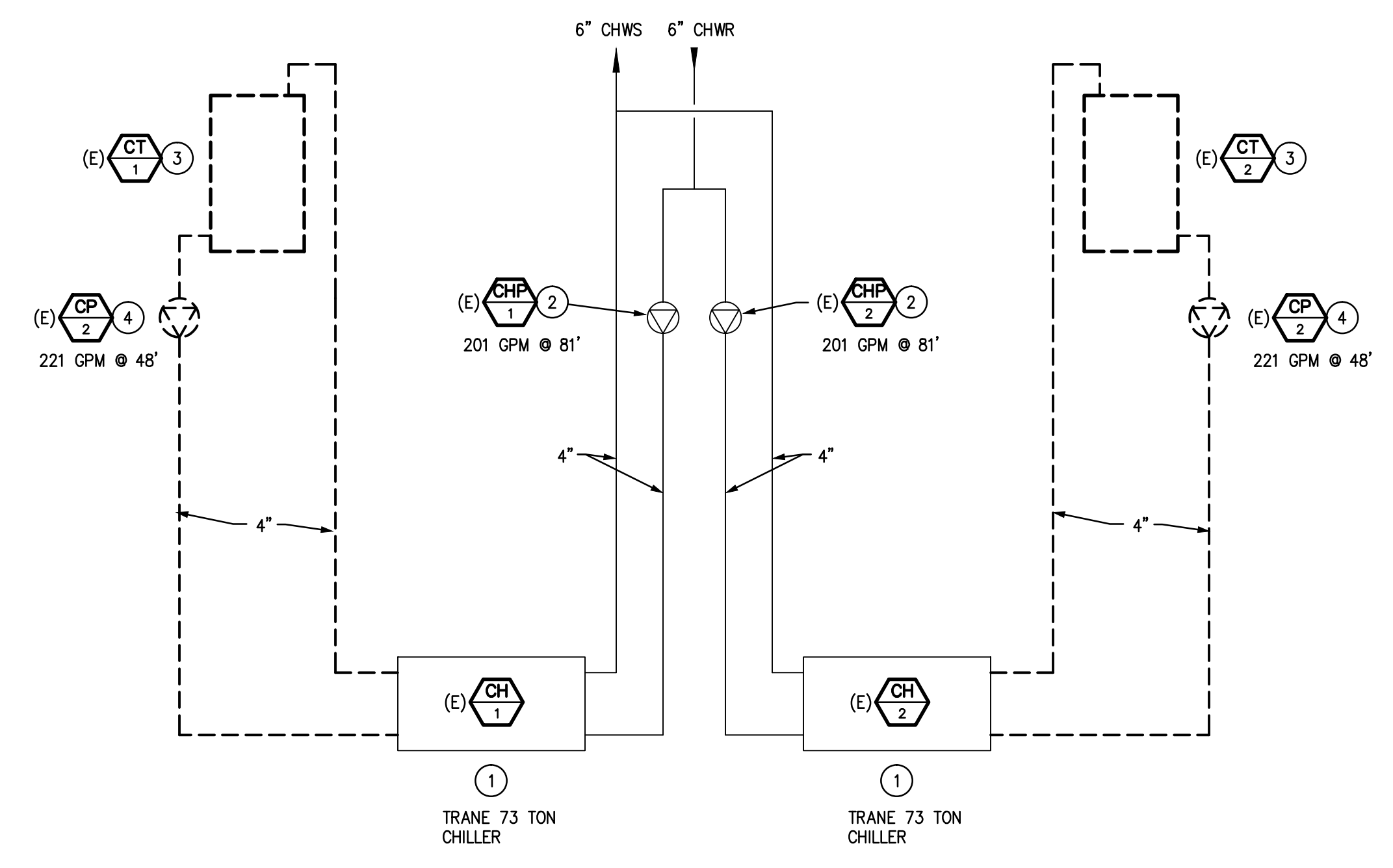
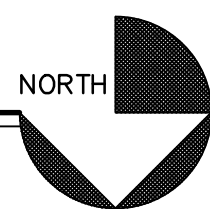
SCALE: 1/4" = 1'-0"





DEMOLITION FLOOR PLAN

SCALE: 1/4" = 1'-0"



CENTRAL PLANT DEMOLITION SCHEMATIC DIAGRAM

NTS

KEYED NOTES (Ⓢ)

1. EXISTING CHILLER TO REMAIN.
2. EXISTING CHILLED WATER PUMP TO REMAIN.
3. REMOVE EXISTING COOLING TOWER AND ASSOCIATED PIPING FOR INSTALLATION OF NEW TOWER.
4. REMOVE EXISTING CONDENSER WATER PUMP AND ASSOCIATED PIPING FOR INSTALLATION OF NEW PUMP.
5. EXISTING EXPANSION TANK TO REMAIN.
6. REMOVE EXISTING CHEMICAL TREATMENT STATION.
7. EXISTING POT FEEDER TO REMAIN.
8. EXISTING CONTROL PANEL TO REMAIN.
9. REMOVE EXISTING FLOOR SINK AND TRAP ARM.

REV.	DATE	DESCRIPTION	BY

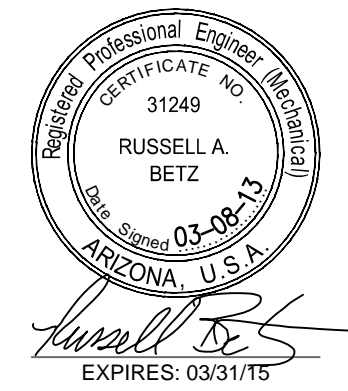
**LSW Engineers**
ARIZONA INCORPORATED

2333 West Northern Avenue
Phoenix, Arizona 85021
Telephone: 602.249.1320
Facsimile: 602.336.3276
E-Mail: lswphx@lswphx.com

DEMOLITION FLOOR PLAN

KYRENE de los LAGOS
ELEMENTARY SCHOOL

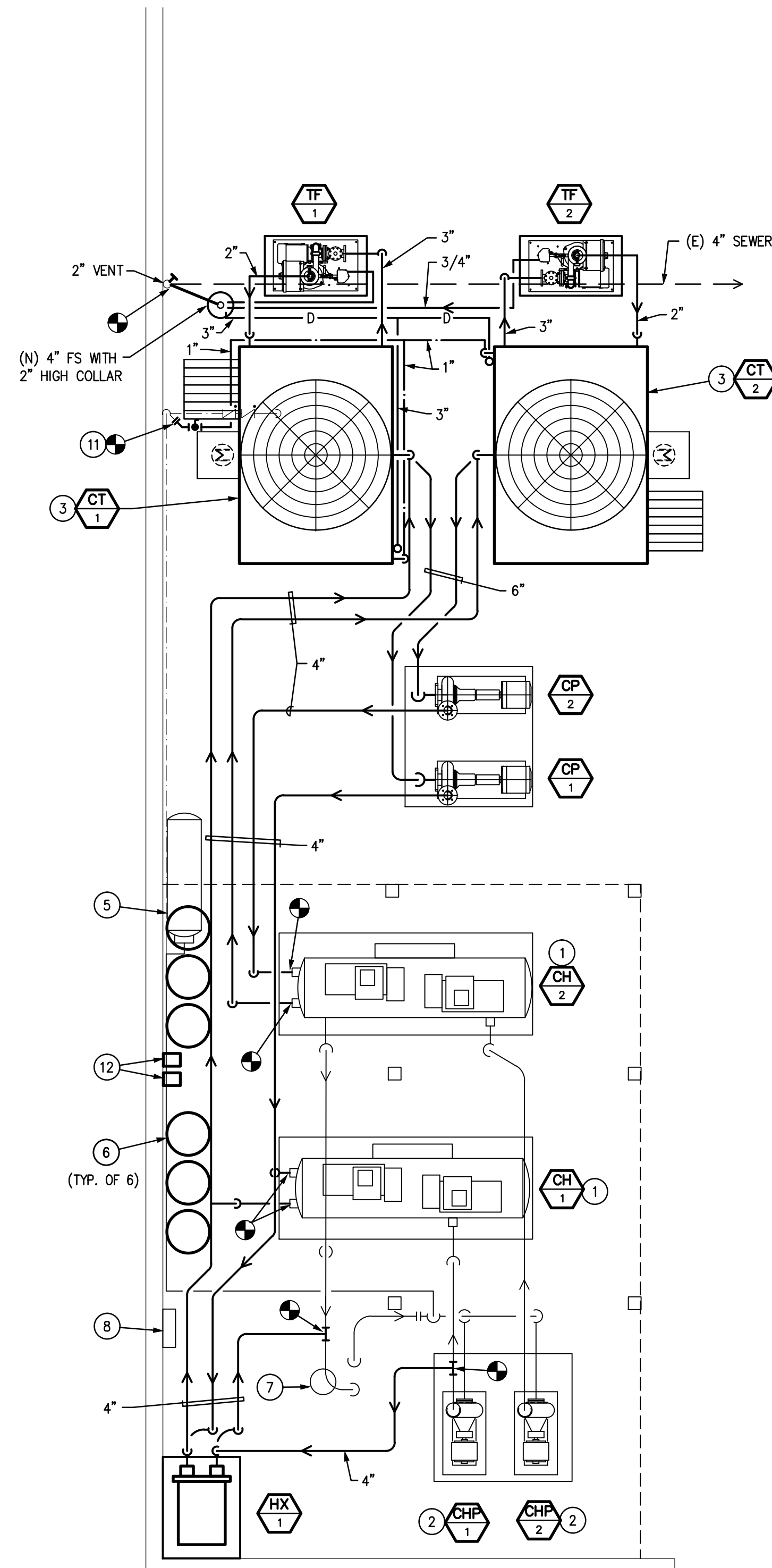
17001 S. 34TH WAY PHOENIX, ARIZONA 85048



DR. BY: TS DES. BY: LAM OKD. BY: LAM/RAB

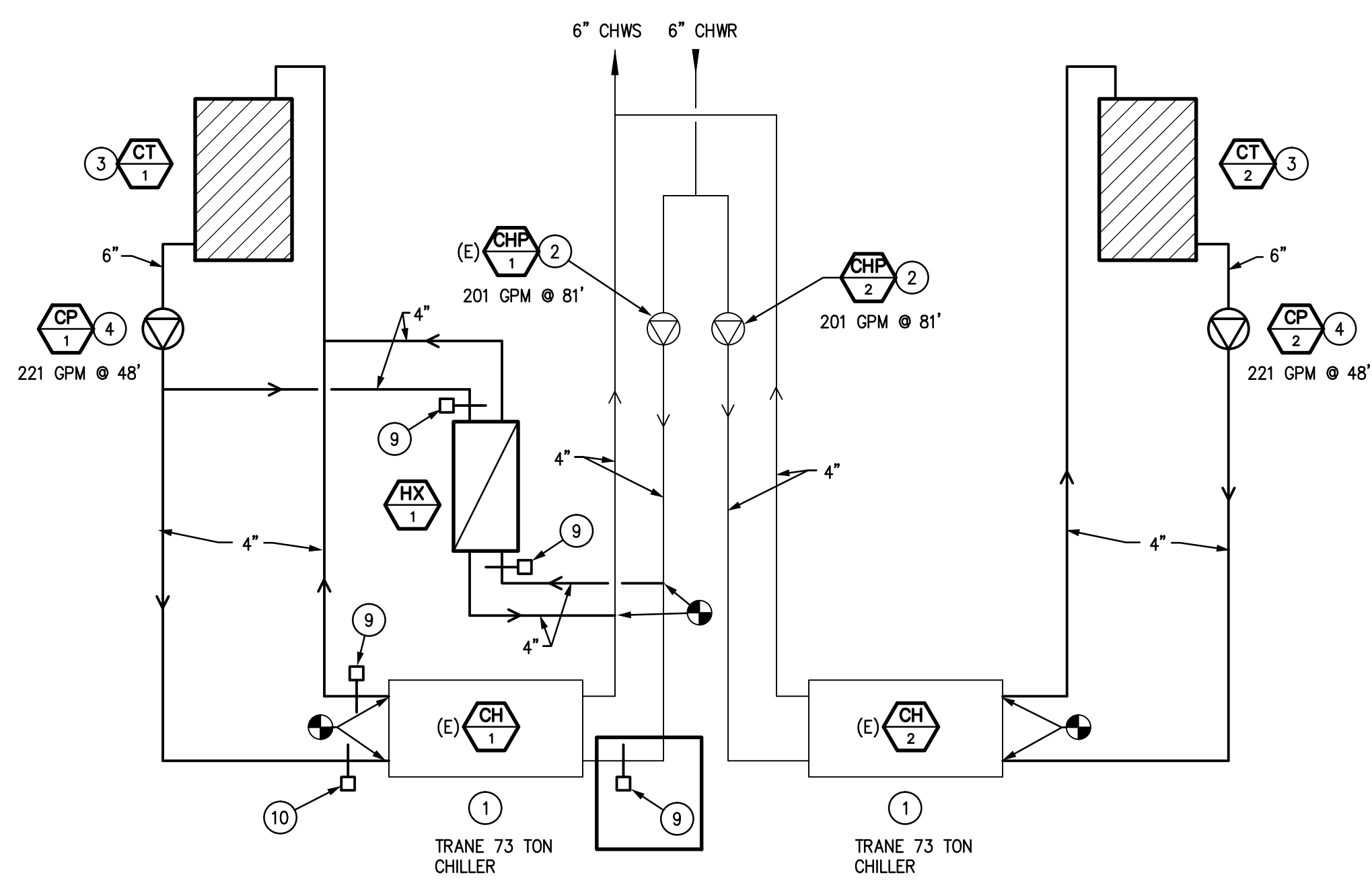
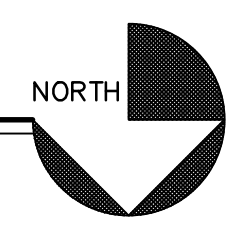
DATE: 02/17/12 JOB NO.: 2011-097.000

SHEET NO.
M-1
OF



NEW FLOOR PLAN

SCALE: 1/4" = 1'-0"



CENTRAL PLANT NEW SCHEMATIC DIAGRAM

NTS

KEYED NOTES (Ⓢ)

- 1. EXISTING CHILLER TO REMAIN.
- 2. EXISTING CHILLED WATER PUMP TO REMAIN.
- 3. NEW COOLING TOWER AND ASSOCIATED PIPING.
- 4. NEW TOWER CONDENSER PUMP.
- 5. EXISTING EXPANSION TANK TO REMAIN.
- 6. NEW CHEMICAL TREATMENT STATION.
- 7. EXISTING POT FEEDER TO REMAIN.
- 8. EXISTING CONTROL PANEL TO REMAIN.
- 9. NEW TWO-POSITION MOTOR OPERATED VALVE.
- 10. NEW HEAD PRESSURE MODULATING MOTOR OPERATED VALVE CONTROLLED BY CHILLER.
- 11. CONNECT TO EXISTING TOWER MAKE-UP WATER.
- 12. NEW COOLING TOWER VFD.

GENERAL NOTES:

- 1. PROVIDE WHEEL HANDLED GEAR DRIVE ACTUATORS ON ALL BUTTERFLY VALVES.

REV.	DATE	DESCRIPTION	BY


**LSW Engineers**
ARIZONA INCORPORATED

2333 West Northern Avenue
Phoenix, Arizona 85021
Telephone: 602.249.1320
Facsimile: 602.336.3276
E-Mail: lswphx@lswphx.com

NEW FLOOR PLAN

KYRENE de los LAGOS
ELEMENTARY SCHOOL

17001 S. 34TH WAY PHOENIX, ARIZONA 85048



DR. BY
TS

DES. BY
LAM

CHK. BY
LAM/RAB

DATE
02/17/12

JOB NO.
2011-097.000

SHEET NO.
M-2
OF

PLATE AND FRAME HEAT EXCHANGER SCHEDULE													
MARK	AREA SERVED	MANUFACTURER	MODEL	MBH	COLD SIDE				HOT SIDE				REMARKS
					GPM	MAX ΔP (FT)	ENT WTR TEMP (°F)	LVG WTR TEMP (°F)	GPM	MAX ΔP (FT)	ENT WTR TEMP (°F)	LVG WTR TEMP (°F)	
HX-1	CH-1 / CT-1	MUELLER	AT40MH/HV	804	221	15.7	50.0	57.3	201	18.6	61.0	53.0	4" CONN., 48 PLATES

PUMP SCHEDULE													
MARK	AREA SERVED	MANUFACTURER	MODEL	TYPE	GPM	HEAD (FT) H2O	MIN EFF %	MAX NPSHR (FT)	MOTOR				REMARKS
									HP	BHP	RPM	V/PH	
CP-1	CT-1	B & G	2-1/2 BB	1510	221	48	72	7.0	5	3.7	1750	480/3	①②③
CP-2	CT-2	B & G	2-1/2 BB	1510	221	48	72	7.0	5	3.7	1750	480/3	①②③






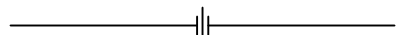


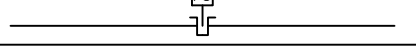
- NOTES:
- ① PROVIDE WITH NON OVERLOADING MOTOR.
- ② PROVIDE WITH TEFC MOTORS.
- ③ PROVIDE WITH PREMIUM EFFICIENCY MOTOR (5 HP OR LARGER)

COOLING TOWER SCHEDULE												
MARK	AREA SERVED	MANUFACTURER	MODEL	WATER			FAN SECTION				OPER WEIGHT LBS	REMARKS
				GPM	INLET °F	OUTLET °F	CFM	WB °F	HP	V/PH		
CT-1 & 2	CH-1 & 2	EVAPCO	USS-19-56L	221	95	85	22,600	78	3 HP	480/3	5,100	① 114% CAPACITY
CT-1 & 2	CH-1 & 2	EVAPCO	AT-19-56L	221	95	85	22,600	78	3 HP	480/3	5,100	② 114% CAPACITY

- NOTES:
- ① PROVIDE WITH INVERTER DUTY MOTOR, LADDER & EXTENSION, REINFORCED BASIN FOR ALT. STEEL SUPPORT, SUMP SWEEPER PIPING, ALL STAINLESS STEEL AND WELDED STAINLESS STEEL BASIN, BOTTOM SUMP & DRAIN & VIBRATION SWITCH.
- ② PROVIDE WITH INVERTER DUTY MOTOR, LADDER & EXTENSION, REINFORCED BASIN FOR ALT. STEEL SUPPORT, SUMP SWEEPER PIPING, BOTTOM SUMP & DRAIN & VIBRATION SWITCH.

TOWER FILTER SCHEDULE									
MARK	AREA SERVED	MANUFACTURER	MODEL	TYPE	GPM	MOTOR		REMARKS	
						HP	V/PH		
TF-1 & 2	CT-1 AND CT-2	LAKOS	TCI-0065-CMBV	CENTRIFUGAL SEPARATOR	65	3	460/3	①②③	


- NOTES:
- ① PROVIDE WITH NON OVERLOADING TEFC MOTOR.
- ② PROVIDE WITH AUTOMATIC PURGE VALVE.
- ③ PROVIDE WITH CONTROL PANEL, INCLUDING STARTER W/ OVERLOAD, HOA SELECTOR SWITCH AND NEMA-4X ENCLOSURE.

MECHANICAL LEGEND		
SYMBOL	ABBR	DESCRIPTION
	CHWS	CHILLED WATER SUPPLY
	CHWR	CHILLED WATER RETURN
	CWS	CONDENSER WATER SUPPLY
	CWR	CONDENSER WATER RETURN
	CD	CONDENSATE DRAIN
	D	DRAIN
		BALL VALVE
	CHK	CHECK VALVE
		BUTTERFLY VALVE
	GV	GATE VALVE
		STRAINER WITH VALVE AND THREADED HOSE CONNECTION
		UNION
		FLEXIBLE PIPE CONNECTION
		THERMOMETER
		PRESSURE GAUGE
	F.S.	FLOW SWITCH
	DN	RISER DOWN
	UP	RISER UP
	POC	POINT OF CONNECTION

ABBREVIATIONS			
A	AMPS	LWB	LEAVING WET BULB TEMPERATURE
AFF	ABOVE FINISHED FLOOR	MAX	MAXIMUM
⊙	AT	MBH	THOUSAND BTU PER HOUR
AD	ACCESS DOOR	MCA	MINIMUM CIRCUIT AMPS
AP	ACCESS PANEL	MCC	MOTOR CONTROL CENTER
AV	AUTOMATIC AIR VENT	MECH	MECHANICAL
BDD	BACKDRAFT DAMPER	MFCB	MAXIMUM FUSE OR CIRCUIT BREAKER
BHP	BRAKE HORSEPOWER	MIN	MINIMUM
BTUH	BRITISH THERMAL UNITS PER HOUR	MV	MANUAL AIR VENT
CAP	CAPACITY	NC	NORMALLY CLOSED
CFM	CUBIC FEET PER MINUTE	NIC	NOT IN CONTRACT
CLG	CEILING	NO	NORMALLY OPEN
DB	DRY BULB TEMPERATURE	NO OR #	NUMBER
DIA	DIAMETER	NPSHR	NET POSITIVE SUCTION HEAD REQ'D
DIFF	DIFFERENCE	NTS	NOT TO SCALE
DN	DOWN	OBD	OPPOSED BLADE DAMPER
DWG	DRAWING(S)	OSA	OUTSIDE AIR
EXH	EXHAUST	OV	OUTLET VELOCITY
EAT	ENTERING AIR TEMPERATURE	PD	PRESSURE DROP
EDB	ENTERING DRY BULB TEMPERATURE	PHG	PHASE
EFF	EFFICIENCY	PSI	POUNDS PER SQUARE INCH
ELEV	ELEVATION	PSIG	POUNDS PER SQUARE INCH GAUGE
ESP	EXTERNAL STATIC PRESSURE	RA	RETURN AIR
EWB	ENTERING WET BULB TEMPERATURE	REQ'D	REQUIRED
EXT	EXTERNAL	RH	RELATIVE HUMIDITY
°F	DEGREES FAHRENHEIT	RM	ROOM
FD	FIRE DAMPER	RPM	REVOLUTIONS PER MINUTE
FF	FINISH FLOOR	SA	SUPPLY AIR
FLA	FULL LOAD AMPS	SCFM	CFM, STANDARD CONDITIONS
FLEX	FLEXIBLE	SD	SMOKE DETECTOR
FPM	FEET PER MINUTE	SFD	SMOKE AND FIRE DAMPER
FPS	FEET PER SECOND	SP	STATIC PRESSURE
FS	FLOW SWITCH	TEMP	TEMPERATURE
FT	FOOT OR FEET	UNO	UNLESS NOTED OTHERWISE
GA	GAGE OR GAUGE	VD	VOLUME DAMPER
GAL	GALLON(S)	VEL	VELOCITY
HT	HEIGHT	V	VOLT
HP	HORSEPOWER	W	WATTS
HZ	HERTZ	W/	WITH
IN	INCH OR INCHES	W/O	WITHOUT
KW	KILOWATT	WG	WATER GAUGE
LBS	POUNDS	WT	WEIGHT
LDB	LEAVING DRY BULB TEMPERATURE	ø	ROUND, DIAMETER

BASE BID

REV.	DATE	DESCRIPTION	BY




LSW Engineers
ARIZONA INCORPORATED

2333 West Northern Avenue
Phoenix, Arizona 85021
Telephone: 602.249.1320
Facsimile: 602.336.3276
E-Mail: lswphx@lswphx.com

LEGEND AND SCHEDULES

KYRENE de los LAGOS
ELEMENTARY SCHOOL

17001 S. 34TH WAY PHOENIX, ARIZONA 85048



DR. BY
LRW

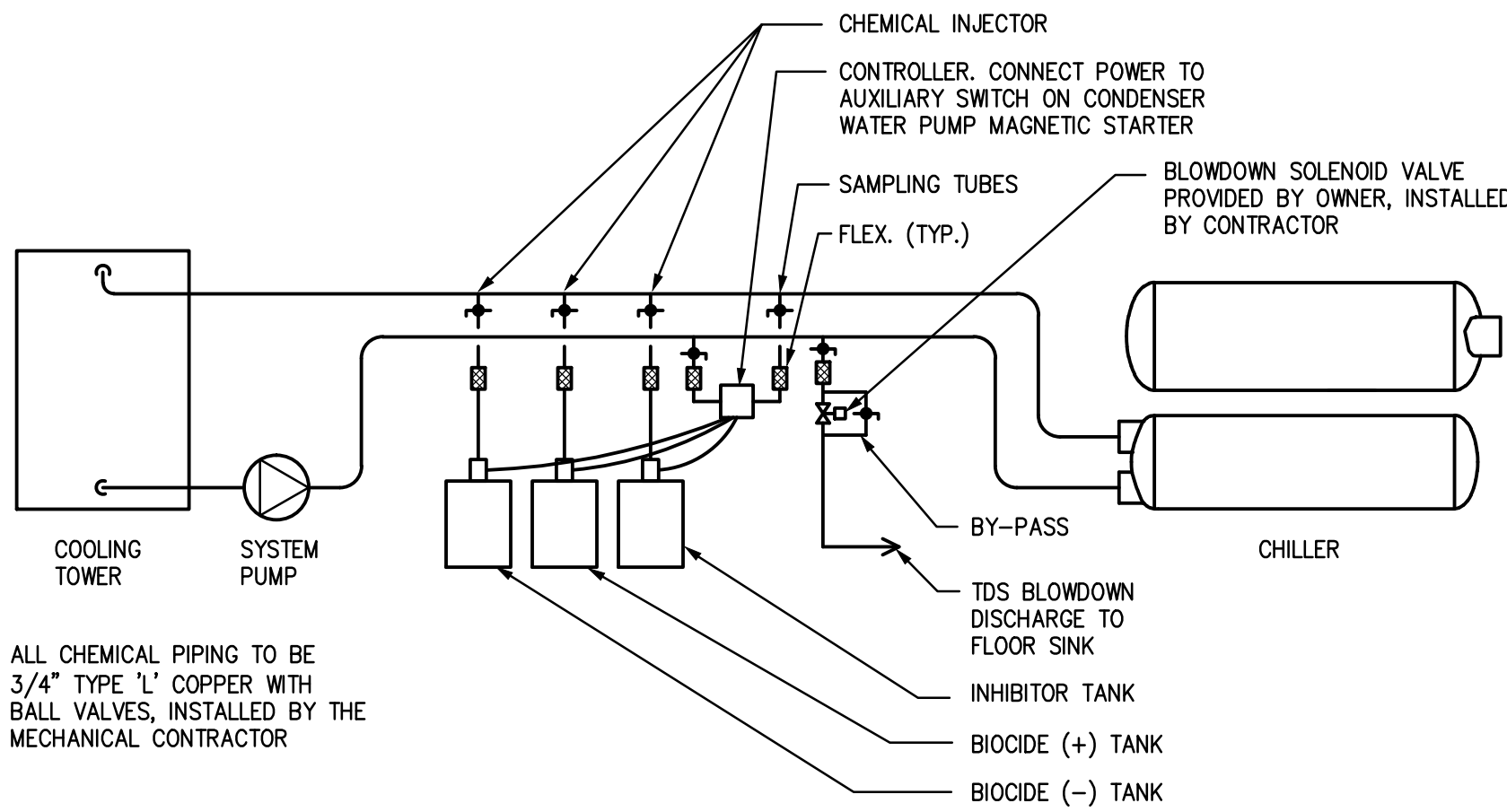
DES. BY
LAM

CKD. BY
LAM/RAB

DATE
02/17/12

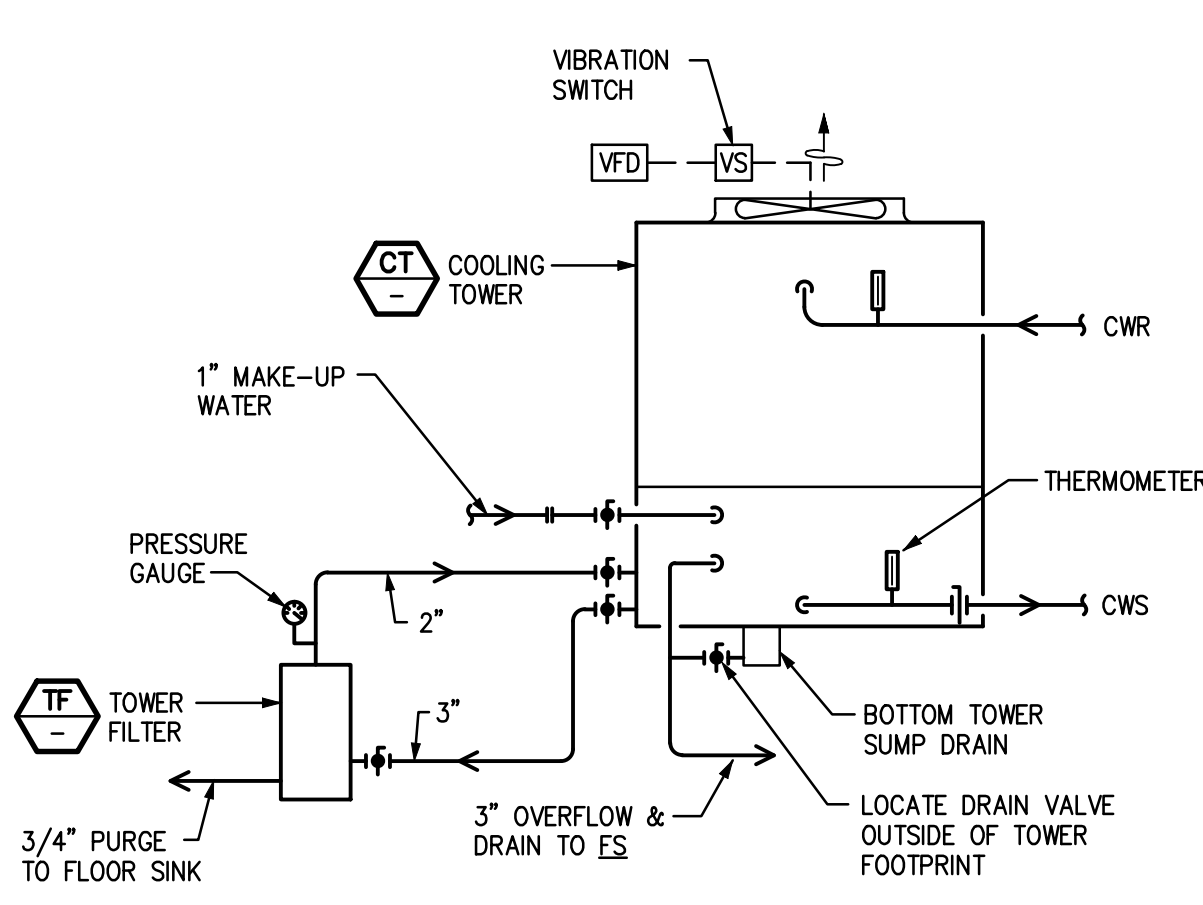
JOB NO.
2011-097.000

SHEET NO.
M-3
OF



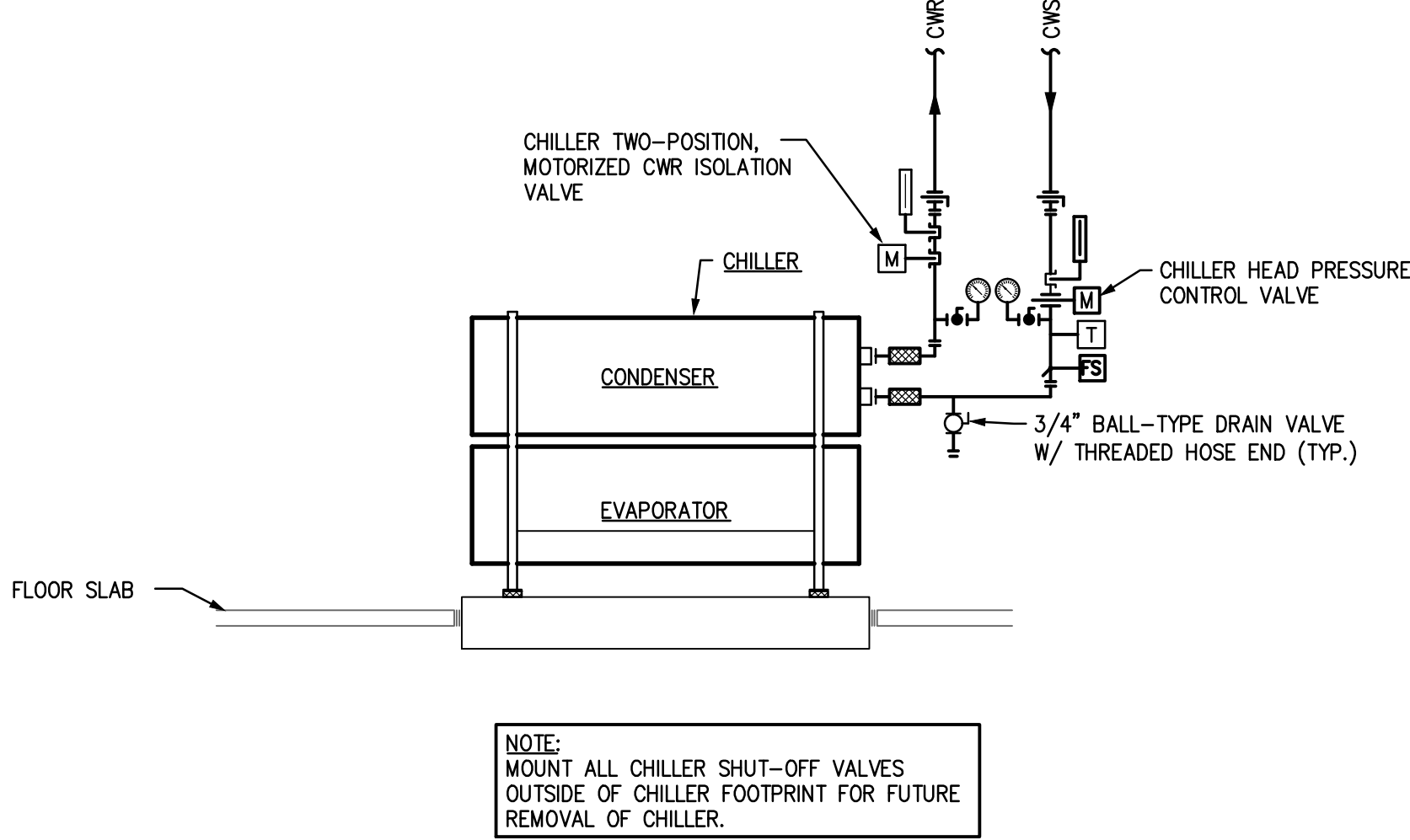
TOWER WATER TREATMENT DETAIL

NTS



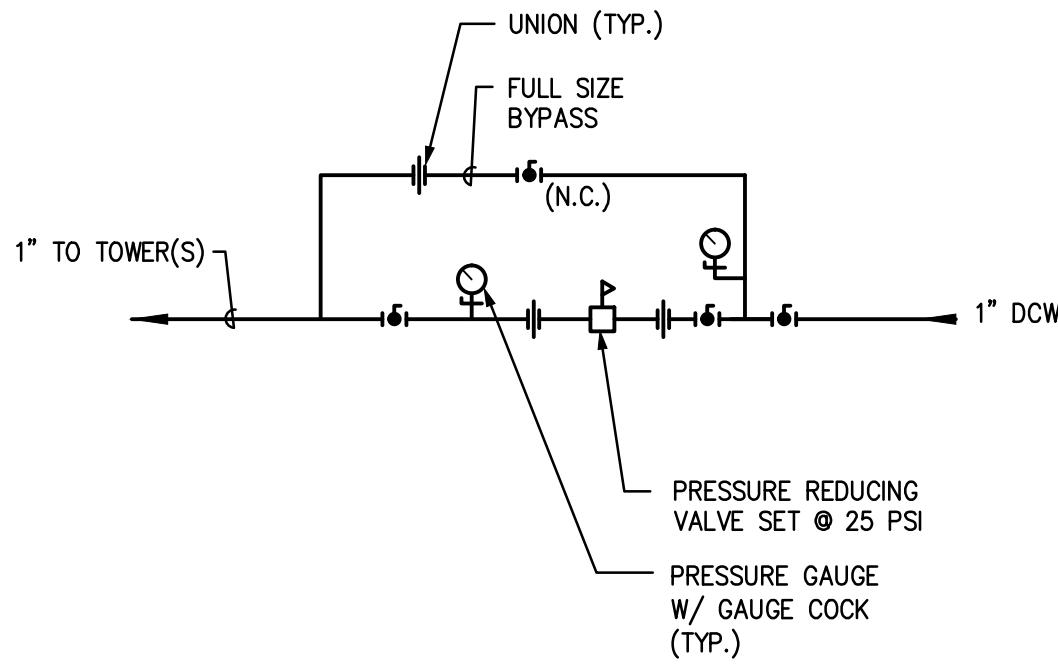
COOLING TOWER DIAGRAM

NTS MAKE-UP WATER, TOWER DRAIN AND ALL FILTER PIPING SHALL BE COPPER.



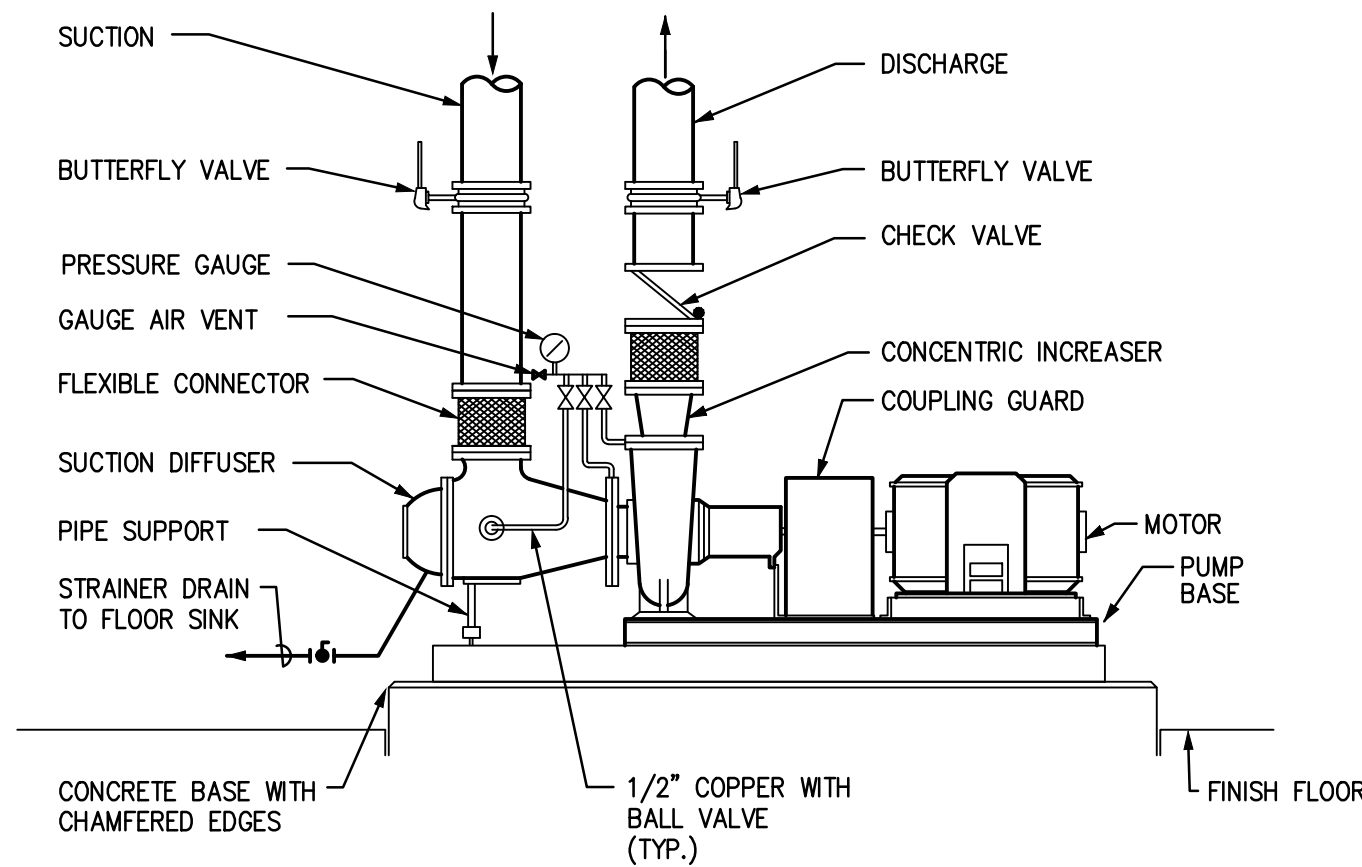
WATER COOLED CHILLER DIAGRAM

NTS



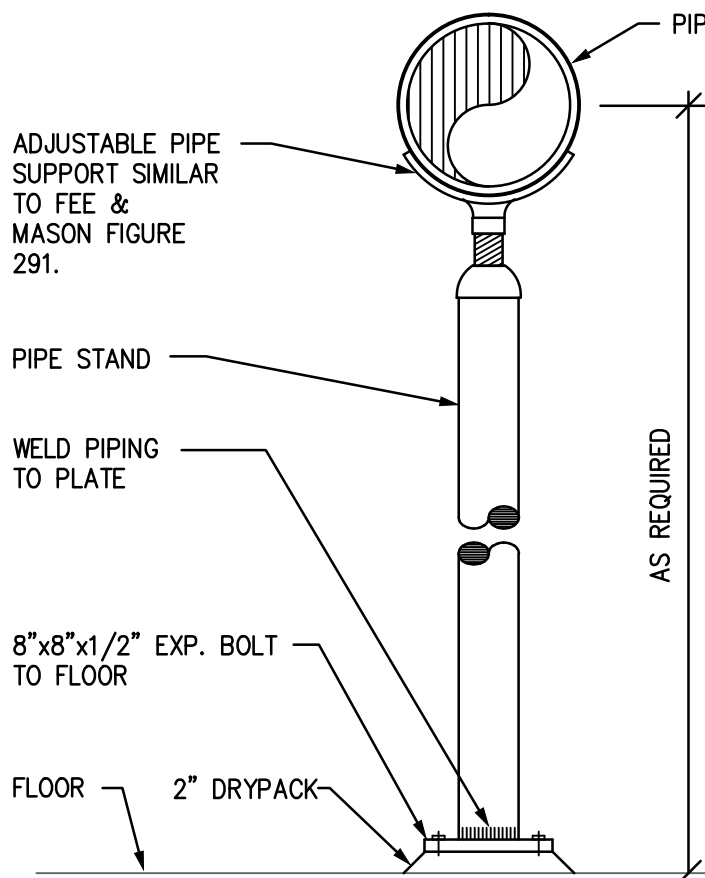
TOWER WATER MAKE-UP PIPING DIAGRAM

NTS



BASE MOUNTED PUMP DETAIL

NTS



PIPE STAND DETAIL

NTS

- GENERAL NOTES:
1. PROVIDE 3/4" WELD-O-LETS FOR CONDENSER AND CHILLED WATER CHEMICAL TREATMENT PIPING.
 2. PROVIDE 3/4" WELD-O-LETS FOR CONDENSER, CHILLED WATER AND THE CONTROL SYSTEM SENSORS. VERIFY QUANTITY AND LOCATIONS. SEE #3 BELOW.
 3. ALL WELD-O-LETS, THERMOMETER, PETE'S PLUGS, CONTROLS, GAUGES, ETC., SHALL BE LOCATED 'BELOW' THE EQUIPMENT'S ISOLATION BUTTERFLY VALVE.

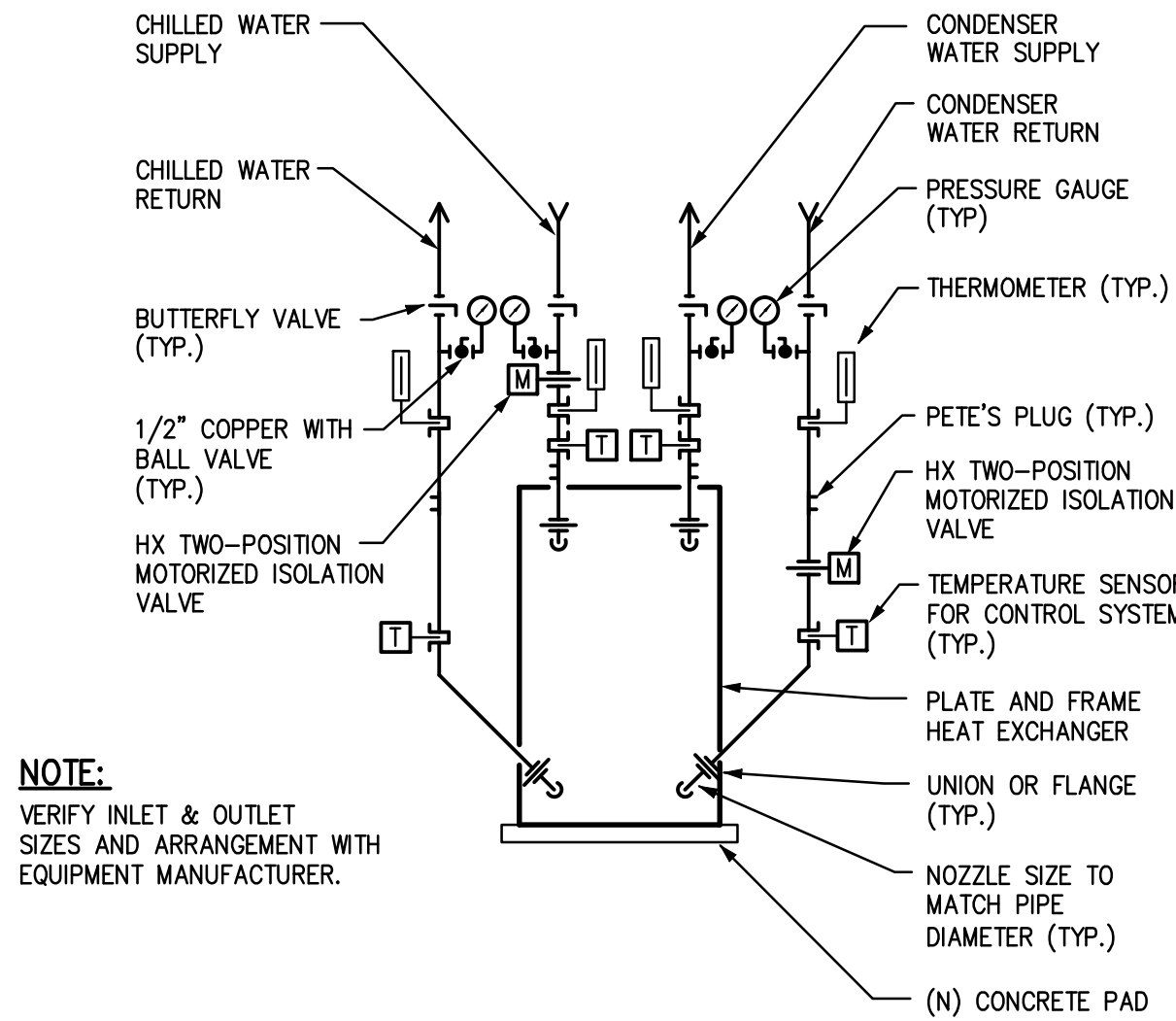
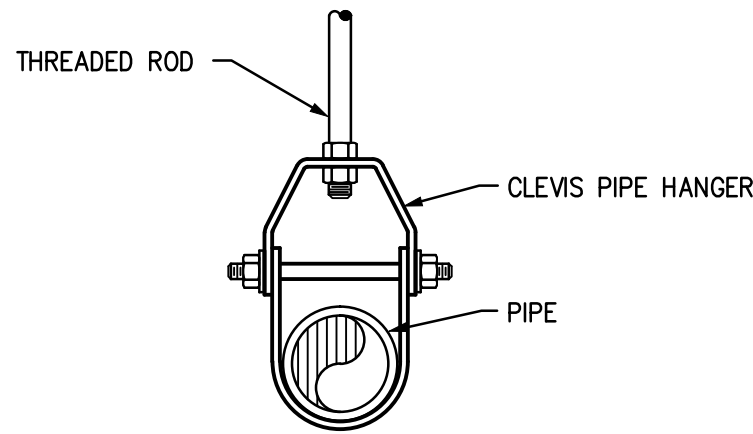


PLATE AND FRAME HEAT EXCHANGER PIPING DETAIL

NTS



NON-INSULATED PIPE SUPPORT DETAIL

NTS

REV.	DATE	DESCRIPTION	BY

LSW Engineers

ARIZONA INCORPORATED

2333 West Northern Avenue
Phoenix, Arizona 85021
Telephone: 602.249.1320
Facsimile: 602.336.3276
E-Mail: lswphx@lswphx.com

DETAILS AND DIAGRAMS

KYRENE de los LAGOS
ELEMENTARY SCHOOL

17001 S. 34TH WAY
PHOENIX, ARIZONA 85048

Professional Engineer
CERTIFICATE NO. 31249
RUSSELL A. BETZ
02-06-13
ARIZONA, U.S.A.
EXPIRES: 03/31/15

DR. BY
LRW

DES. BY
LAM

CHK. BY
LAM/RAB

DATE
02/17/12

JOB NO.
2011-097.000

SHEET NO.

M-4
OF

GERVASIO & ASSOC., INC.

CONSULTING ENGINEERS

77 EAST THOMAS ROAD, SUITE 120

PHOENIX, ARIZONA 85012

(602) 285-1720 • (602) 285-1530 (FAX)

JOB NO.: 1151

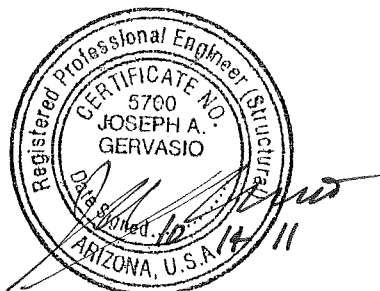
BY: RD

PARTIAL CALCULATIONS

PROJECT: KYRENE DE LOS CAGOS-MECH. EQUIP.
17001 S. 34TH. WAY
PHOENIX, AZ 85048
CLIENT: LSW ENGINEERS

ITEM	SHEET
<u>DESIGN CRITERIA</u>	<u>D-1</u>
<u>MECH. EQUIP. SUPPORT</u>	<u>M-1</u>
<u>FOUNDATIONS</u>	<u>F-1</u>

These calculations are an instrument of service and are the property of GERVASIO & ASSOC., INC. They are only for this project and location and may not be reproduced without written permission.



EXPIRES 12/31/11

10/08 - 7F

GERVASIO & ASSOC., INC.

CONSULTING ENGINEERS

(602) 285-1720 • 77 East Thomas Road, Suite 120

Phoenix, Arizona 85012

Date 8/11 Job No. 1151
By RD Sheet No. D-1

GENERAL - DESIGN CRITERIA

CODE 2006 INTERNATIONAL BUILDING CODE

DESIGN CRITERIA

DEAD LOADS: ROOF: NA PSF
FLOOR: NA PSF
LIVE LOADS: ROOF: NA PSF
FLOOR: NA PSF
LATERAL LOADS: WIND: 90 MPH (3 SECOND GUST WIND SPEED),
EXPOSURE C

SEISMIC: DESIGN CATEGORY B
 $S_{DS} = 0.225$ $I_e = 1.25$

ALLOWABLE STRESSES

CONCRETE: REGULAR WT. CONC. $f_c = 3,000$ PSI

STRUCTURAL DESIGN BASED ON $f_c = 2,500$ PSI
NO SPECIAL STRUCTURAL INSPECTION REQ'D.

REINF. STEEL: ASTM A-615, GRADE 60, $F_y = 60$ KSI

STRUCT. STEEL: ROLLED SECTIONS: ASTM A-992, GRADE 50, $F_y = 50$ KSI
~~PLATES, ANGLES AND CHANNELS: ASTM A-36, $F_y = 36$ KSI~~
BOLTS: ASTM A-307
~~PIPES: ASTM A-53, GRADE B, $F_y = 35$ KSI~~
~~TUBES: ASTM A-500, GRADE B, $F_y = 46$ KSI~~
WELDING: E-70 SERIES ELECTRODES

SOIL: Q MAX = 1000 PSF @ 1'-6" MIN. BELOW GRADE
PER CITY OF PHX AMENDMENTS
SOIL REPORT BY NONE

DATED _____ JOB # _____

GERVASIO & ASSOC. INC.
CONSULTING ENGINEERS

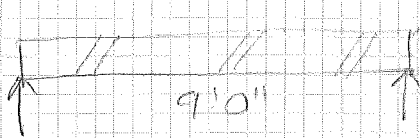
(602) 285-1720 • 77 East Thomas Road, Suite 120
PHOENIX, ARIZONA 85012-3115

Date 8/11
By RD

Job No. 1151
Sheet No. M-1

KYRENE-CAGOS COOLING TOWER BEAMS
OPERATING WT. = 5100#
UNIT SIZE: 5'-11 7/8" X 8'-5 1/2" X 10'-8 1/4"

BEAM SPAN = 9'-0"



$$W_1 = 5100\# \times 1.20 = 6120\#$$

↑ IRC 1607.8.2

$$W_1 = \frac{6120\#}{2 \text{ bms}} = \frac{3060\#}{8'-5 1/2"} = 362 \text{ PCF}$$

TRY W8X24 $b_f = 6 1/2$

$$M = \frac{W_1 L^2}{8} = \frac{(0.362 + 0.026)(9)^2}{8} = 3.93 \text{ K}$$

→ SEE M-2 & M-3

Title : Kyrene Cooling Towers
 Dsgnr: RD
 Description :

Job # 1151
 Date: 4:12PM, 2 OCT 11 M-2

Scope :

Rev: 580002
 User: KW-0604298, Ver 5.8.0, 1-Dec-2003
 (c)1983-2003 ENERCALC Engineering Software

Steel Beam Design

Page 1
 1151 kyrene mech. units.ecw:Calculations

Description Kyrene - Lagos Cooling Tower

General Information

Code Ref: AISC 9th ASD, 1997 UBC, 2003 IBC, 2003 NFPA 5000

Steel Section : W8X24

Center Span 9.00 ft
 Left Cant. 0.00 ft
 Right Cant 0.00 ft
 Lu : Unbraced Length 9.00 ft

Pinned-Pinned
 Bm Wt. Added to Loads
 LL & ST Act Together

Fy 50.00ksi
 Load Duration Factor 1.00
 Elastic Modulus 29,000.0 ksi

Distributed Loads

Note! Short Term Loads Are WIND Loads.

	# 1	# 2	# 3	# 4	# 5	# 6	# 7	
DL	0.362							k/ft
LL								k/ft
ST								k/ft
Start Location								ft
End Location								ft

Summary

Beam OK
 Static Load Case Governs Stress

Using: W8X24 section, Span = 9.00ft, Fy = 50.0ksi
 End Fixity = Pinned-Pinned, Lu = 9.00ft, LDF = 1.000

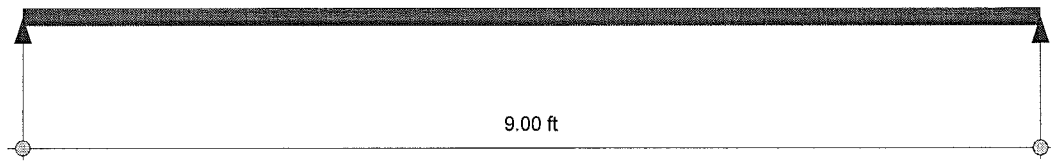
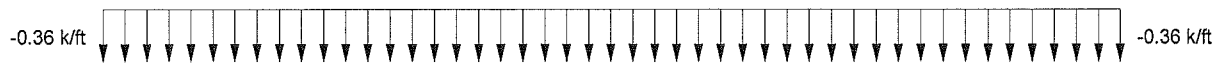
	Actual	Allowable
Moment	3.909 k-ft	52.250 k-ft
fb : Bending Stress	2.244 ksi	30.000 ksi
fb / Fb	0.075 : 1	
Shear	1.737 k	38.857 k
fv : Shear Stress	0.894 ksi	20.000 ksi
fv / Fv	0.045 : 1	

Max. Deflection -0.024 in
 Length/DL Defl 4,545.1 : 1
 Length/(DL+LL Defl) 4,545.1 : 1

Fa calc'd per Eq. E2-2, $K^*L/r > C_c$

I Beam, Major Axis, $(102,000 * C_b / F_y)^{.5} \leq L/r \leq (510,000 * C_b / F_y)^{.5}$, Fb per Eq. F1-6

I Beam, Major Axis, Fb per Eq. F1-8, $F_b = 12,000 C_b A_f / (l * d)$



$$M_{\max} = 3.90 \text{ k-ft}$$

$$D_{\max} = -0.0237 \text{ in}$$

$$L_{\max} = 1.737 \text{ k}$$

$$V_{\max @ \text{left}} = 1.737 \text{ k}$$

$$R_{\max} = 1.737 \text{ k}$$

$$V_{\max @ \text{rt}} = 1.737 \text{ k}$$

GERVASIO & ASSOC. INC.
CONSULTING ENGINEERS

(602) 285-1720 • 77 East Thomas Road, Suite 120
PHOENIX, ARIZONA 85012-3115

Date 8/11
By RD

Job No. 1151
Sheet No. F-1

DETERMINE SEISMIC DESIGN CATEGORY

o SITE CLASS D PER IBC SECTION 1613.5.2

o ZIP CODE: 85048 PHX LAGOS

85284 TEMPE OCCUPANCY CATEGORY III
MANIPASA

$I = 1.25$

SOIL SITE CLASS D

$S_{DS} = 0.225$ LAGOS; $S_{DS} = 0.235$ MANIPASA

ASCE 7-05

$$0.3 S_{DS} I_p W_p < F_p \leq F_p = 1.6 S_{DS} I_p W_p \quad (\text{EQ. 13.3-2})$$

$$F_p = 1.6 (1 S_{DS}) (1.25) W_p$$

WIND LOAD ASCE 7-05 SECTION 6.5.15

$$F = q_z G C_F A_F$$

$$G = 0.85$$

90 MPH, EXP. C

$$h/D = 11'8\frac{1}{4}''$$

10'8 $\frac{1}{4}$ ''

5'11.875''

1.80

FIG 6-21

$$7'5.875'' = 1.56 \rightarrow C_F = 1.31$$

$$q_z = 0.00256 K_z K_{z6} K_d V^2 I$$

$$K_z = \text{(TABLE 6-3) VARIES}$$

$$K_{z6} = 1.0 \quad (\text{FIG 6-4})$$

$$K_d = 0.85$$

$$I = 1.15 \quad \text{OCCUPANCY CATEGORY III}$$

$$q_z = 0.00256 (K_z) (1.0) (0.85) (90)^2 (1.15) = 20.3 K_z$$

$$F = 20.3 K_z (0.85) (1.31) A_F = 22.6 K_z A_F$$

GERVASIO & ASSOC. INC.
CONSULTING ENGINEERS

(602) 285-1720 • 77 East Thomas Road, Suite 120
PHOENIX, ARIZONA 85012-3115

Date 8/11
By RD

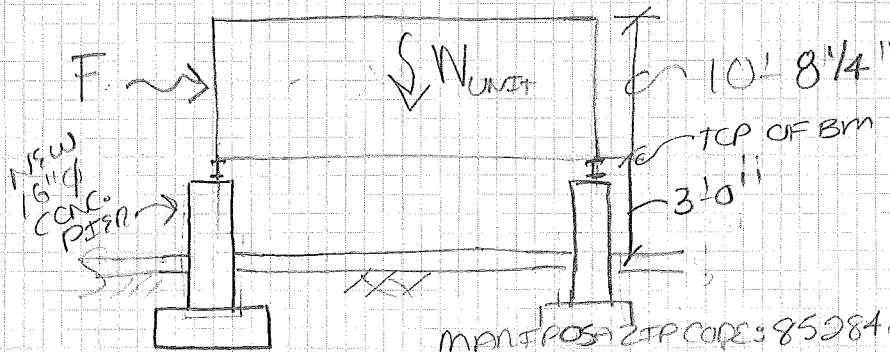
Job No. 1151
Sheet No. F-2

LAGOS COOLING TOWER CATERAC LOADS

MANIPROSA

OPERATING WT. = 5100#

UNIT SIZE: 5'-11⁷/₈" X 8'-5¹/₂" X 10'-8¹/₄" HIGH



MANIPROSA ZIP CODE: 85284
LAGOS ZIP CODE: 85018

$$W_L = 5100 \# \times 1.20 = 6120 \#$$

IRC 1607.8.2

$$F_{SEISMIC} = 1.6 S_{DS} I_p W_p$$

$$= 1.6 (0.225) (1.25) W_p = 0.45 W_p = 0.45 (5100 \#)$$

$$F_{WIND} = 20.3 K_z = 17.3 \text{ PSF}$$

0.85 HEIGHT

$$F_{WIND} = 17.3 \text{ PSF} (10'-8 \frac{1}{4}")(8'-5 \frac{1}{2} ") = 1564 \#$$

~> SEISMIC CONTROLS

LOAD COMBINATIONS

FOR BEAM DESIGN

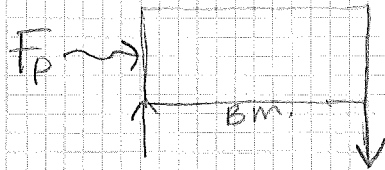
$$\textcircled{1} E = E_h + E_v = 1.0 E + 0.2 S_{DS} D$$

$$= 1.0 (2295 \#) + 0.2 (0.225) (6120)$$

$$= 2295 \# + 275 = 2570 \# \text{ LAGOS}$$

$$2120 + 212 \# = 2332 \# \text{ MANIPROSA}$$

0 FOR FOUNDATION DESIGN



$$\textcircled{2} E = E_h + E_v$$

$$E = E_h = F_s = 2295 \# \text{ LAGOS}$$

$$2120 \# \text{ MANIPROSA}$$

GERVASIO & ASSOC. INC.
CONSULTING ENGINEERS

(602) 285-1720 • 77 East Thomas Road, Suite 120
PHOENIX, ARIZONA 85012-3115

Date 8/11
By RD

Job No. 1151
Sheet No. F3

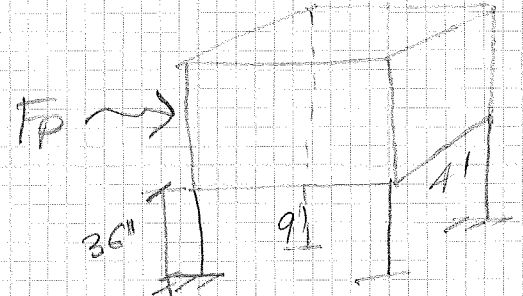
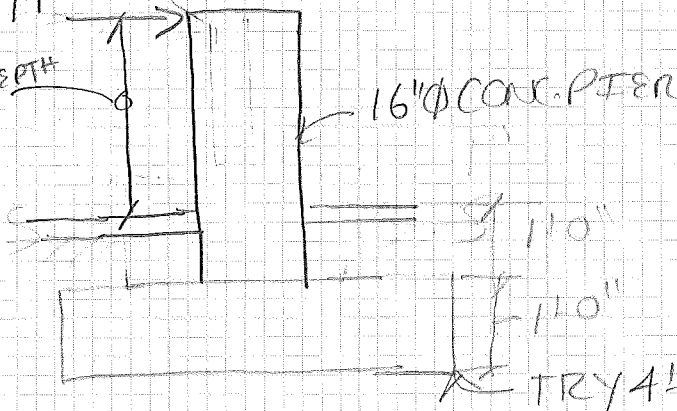
LAGOS FOOTING DESIGN

MANIPROSA

$$F_p = \frac{2295 \#}{4 \text{ FTGS.}} = 574 \#$$

LAGOS 574 #

3' BM. DEPTH
= 2.19'



$$OTM = 574 \# (2.19' + 2.0') = 2.41 \text{ K LAGOS}$$

RESISTING MOMENT

$$\text{CONC. PIER } 150 \times \pi \times (1.33)^2 / 4 = 208 \#$$

$$\text{CONC. FTG. } 150 \times 4' \times 4' \times 1' = 2400 \#$$

$$\text{SOFC WT. } 100 \times 2.67 \times 2.67' \times 1' = 713 \#$$

$$\Sigma W = 3321 \# + 1737 \# = 5058 \#$$

$$RM = 5.06 \times (2') = 10.12 \text{ K}$$

$$FS = 10.12 / 2.41 = 4.1 > 1.5 \text{ O.K.}$$

CHECK SOIL PRESSURE

$$\text{LAGOS } X = \frac{10.12 - 2.41}{5.06} = 1.52$$

$$> \frac{L}{3} = 1.33'$$

AS INSIDE
MIDDS 1/3RD
OF FTG.

$$R = \frac{P}{A} + \frac{M}{S} = \frac{5.06}{4^2} + \frac{2.41}{4 \times 4^2 / 6}$$

$$= 316 + 226 = 542 \text{ PSF} < 1000 \text{ PSF LAGOS}$$

$$1500 \text{ PSF MANIPROSA}$$

O.K.

GERVASIO & ASSOC. INC.
CONSULTING ENGINEERS

(602) 285-1720 • 77 East Thomas Road, Suite 120
PHOENIX, ARIZONA 85012-3115

Date 9/11
By RD

Job No. 1151
Sheet No. F-4

LAGOS & MANIPULA FOOTING

TRY 3'-0" SQ. X 12"

RESISTING MOMENT

CONC. PIER = 208 #

CONC. FTG. = 1350 #

SOIL WT. = 278 #

$\Sigma W = 1836 \# + 1737 \# = 3573 \#$

$R_m = 3573(1.5') = 5.40 \text{ K}$

$O_m = 2.41 \text{ K}$

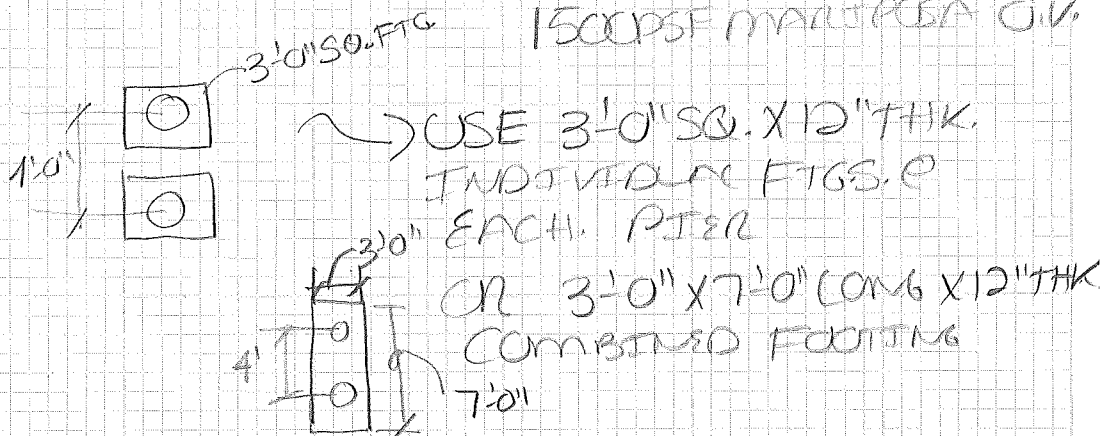
$F.S. = 2.2 > 1.5 \text{ O.K.}$

CHECK SOIL PRESSURE

$X = \frac{5.40 - 2.41}{3.57} = 0.84 < \frac{L}{3} = 1.0 \text{ IS OUTSIDE MIDDLE 1/3RD OF FTG.}$

$P = \frac{2(3.57 \text{ K})}{3(0.84)(3')} = 944 \text{ PSF} < 1000 \text{ PSF LAGOS O.K.}$

1500 PSF MANIPULA O.K.



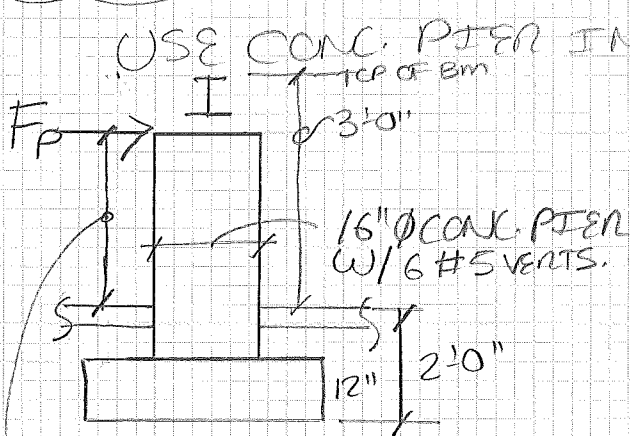
GERVASIO & ASSOC. INC.
CONSULTING ENGINEERS

(602) 285-1720 • 77 East Thomas Road, Suite 120
PHOENIX, ARIZONA 85012-3115

Date 8/11
By RO

Job No. 1151
Sheet No. F-5

LAGOS & MARIPOSA . PIER DESIGN



$$F_{p \text{ MARIPOSA}} = \frac{2295 \#}{4 \text{ PIERS}} = 574 \#$$

$$M_{\text{PIER}} = 0.574 (3.19') = 1.83 \text{ K}$$

$$\text{WSD } A_{s \text{ req'd}} = \frac{1.83 \text{ K}}{1.76(d)} = 0.13 \text{ in}^2$$

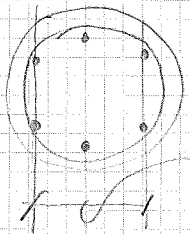
X 1.33

$$\uparrow \text{GRADE 60} \quad 8 \text{ in} = 0.17 \text{ in}^2$$

FOR FLEXURE
ACI
10.5.3

$$3'-0" - (8" + \frac{3}{4}" + 1") = 2.19' + 1'-0" = 3.19'$$

93 1/4"



$$d = 16" - 4" = 12" - 2" = 10"$$

USE d = 8"

$A_{s \text{ min}}$ PER ACI 10.8.4

$$A_{s \text{ min}} = 0.01 \frac{A_g}{2}$$

$$A_{s \text{ min}} = 0.005 A_g$$

$$= 0.005 \frac{\pi (16")^2}{4} = 1.0 \text{ in}^2$$

$$\text{OR } \frac{A_g}{2} \times 0.01 = 1.0 \text{ in}^2$$

$$(6) \#5 \text{ VERTS. } A_s = 6 \times 0.31 = 1.86 \text{ in}^2$$

$$> 1.0 \text{ in}^2 \text{ O.K.}$$

USE 16" CONCRETE PIER
W/ (6) #5 VERTS. &
#4 TIES @ 10" O.C.

GERVASIO & ASSOC. INC.
CONSULTING ENGINEERS

(602) 285-1720 • 77 East Thomas Road, Suite 120
PHOENIX, ARIZONA 85012-3115

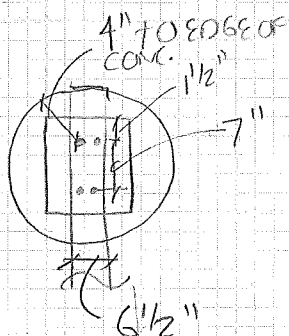
Date 8/11
By RD

Job No. 1151
Sheet No. F-6

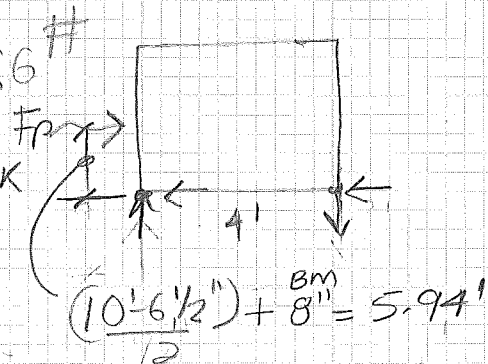
LAGOS & MARITOSA
CHECK ANCHORAGE @ FOOTING

$$F_{P_{MANITROSA}} = 2332 \frac{\#}{2} = 1166 \#$$

$$T = C = \frac{1,166 \text{ K} (5.94')}{4} = 1.73 \text{ K}$$



7" BOLT TO EDGE OF CONCRETE = 4"
SPACINGS = 7" LONG DIRECTION
SHORT DIRECTION = 4"



TRY (1) 5/8" A.B.'S $F'_c = 2.5 \text{ KSI}$

5/8" ALLOW. $T = 1500 \#$ EDGE DIST. $3 \frac{3}{4}"$
ALLOW. $V = 2750 \#$ SPACING = $7 \frac{1}{2}"$

$$T/BOLT = 1730 \frac{\#}{4} = 433 \#$$

$$V/BOLT = 1166 \frac{\#}{2 \text{ PIERS}} = 583 \frac{\#}{4 \text{ BOLTS}} = 150 \frac{\#}{BOLT}$$

INTERPOLATE BOLT SPACING

$3 \frac{3}{4}"$	750	1375 #
4"	T_{allow}	V_{allow}
$7 \frac{1}{2}"$	1500	2750

$$T_{allow} = 800 \# ; V_{allow} = 1467 \#$$

$$\left(\frac{433}{800} \right)^{5/3} + \left(\frac{150}{1467} \right)^{5/3} = 0.10 < 1.0 \text{ O.K.}$$

→ USE (1) 5/8" A.B.'S
@ TOP OF CONCRETE PIER

(APPLY UNLESS NOTED OTHERWISE ON DRAWINGS)

1. 2006 International Building Code with City of Phoenix Amendments

- DESIGN LOADS**
1. Dead Loads:
 - a. Mechanical Equipment & Piping; See plans
 2. Lateral Loads:
 - a. Wind: 90 MPH, 3 second gust. Exposure C, $I = 1.15$
 - b. Seismic: $S_{05} = 0.225$, Seismic Design Category B, $I = 1.25$

1. Bear footings on firm, compacted soil at 2'-0" minimum below existing slab.
2. Allowable soil bearing pressure = 1000 psf, per IBC Table 1804.2.
3. Foundations are designed for dry conditions and must remain dry during construction.

1. Minimum 3000 psi compressive strength at 28 days with Type II cement per ASTM C150; aggregate per ASTM C33, 1" minimum rock for footings and 3/4" minimum rock for other concrete. Replace cement with fly-ash at a rate of 15% to 20% by weight of the total cementitious materials. Fly-ash shall conform to ASTM C618, Type F. Structural design based on 2500 psi, no special inspection required.
2. Maximum slump 4 1/2".
3. ACI codes, recommendations and practices apply.
4. Mechanically vibrate all concrete.
5. Non-shrink grout shall be non-metallic with a minimum compressive strength of 4000 psi in 3 days, mixed and installed in accordance with the manufacturer's recommendations.
6. Non-shrink grout and drypack shall be installed under beams bearing plates plates before loading members.

1. ASTM A615, Grade 60, deformed bars, except #2 bars. CRSI and ACI manuals apply.
2. Clear concrete coverages per details.
3. Lap splices in concrete 36 bar diameters.
4. Place reinforcing per ACI 318-05 and CRSI Standards.

1. AISC and AWS codes and handbooks apply.
2. Rolled wide flange sections: ASTM A992. Grade 50, $F_y = 50$ ksi minimum
3. Plates: ASTM A36, $F_y = 36$ ksi minimum.
4. Bolts: ASTM A307.
5. Anchor bolts: ASTM F1554-99. $F_y = 36$ ksi minimum.
6. Minimum embedment of bolts and anchors in masonry, grout or concrete shall be 5" with a 3" hook or headed stud unless noted otherwise on details.

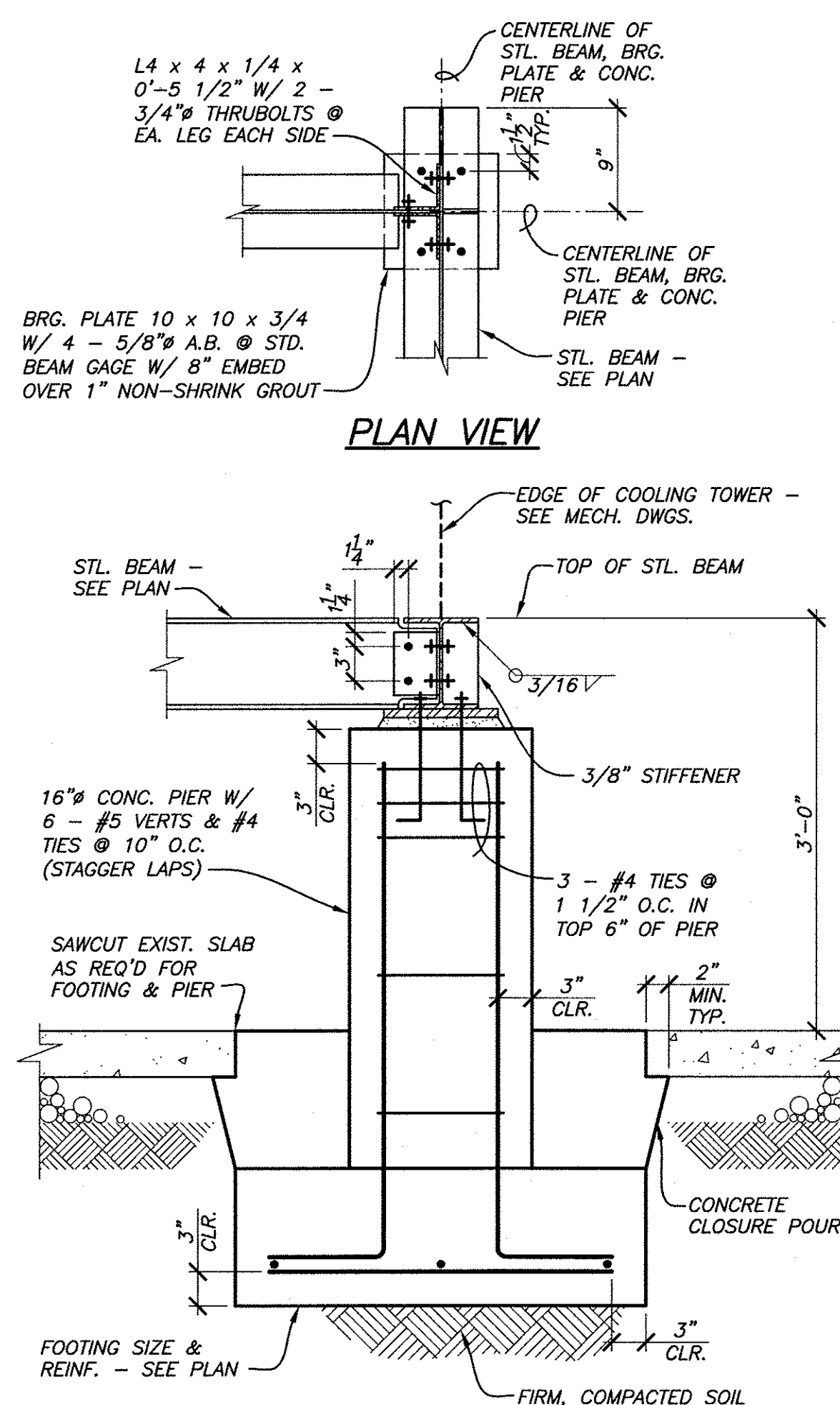
1. Verify all dimensions and conditions prior to starting work. Notify the Mechanical Engineer of any discrepancies or inconsistencies.
2. Verify in field all existing conditions shown on drawings.
3. Establish and verify all openings and inserts for mechanical, electrical and plumbing with appropriate trades, drawings.
4. Provide all necessary temporary bracing, shoring, guying, or other means to avoid excessive stresses and to hold structural elements in place during construction.
5. Options are for the contractor's convenience. He shall be responsible for all changes necessary if he chooses an option and shall coordinate all details. The cost of additional design work necessitated by selection of an option shall be borne by the contractor. Options shall not delay construction schedule.
6. The cost of additional design work due to errors or omissions in construction shall be borne by the contractor.
7. Any engineering design provided by others and submitted for review shall bear the seal and signature of an Engineer registered in Arizona. If this engineering design requires special structural inspection, they shall be responsible for the inspection.
8. Details on the Structural Drawings are typical. Verify all dimensions with the Mechanical Drawings.

Special Inspection is required for all remodel work. Call Structural Engineer for inspection; phone number (602) 285-1720. Provide 48 hours notice.

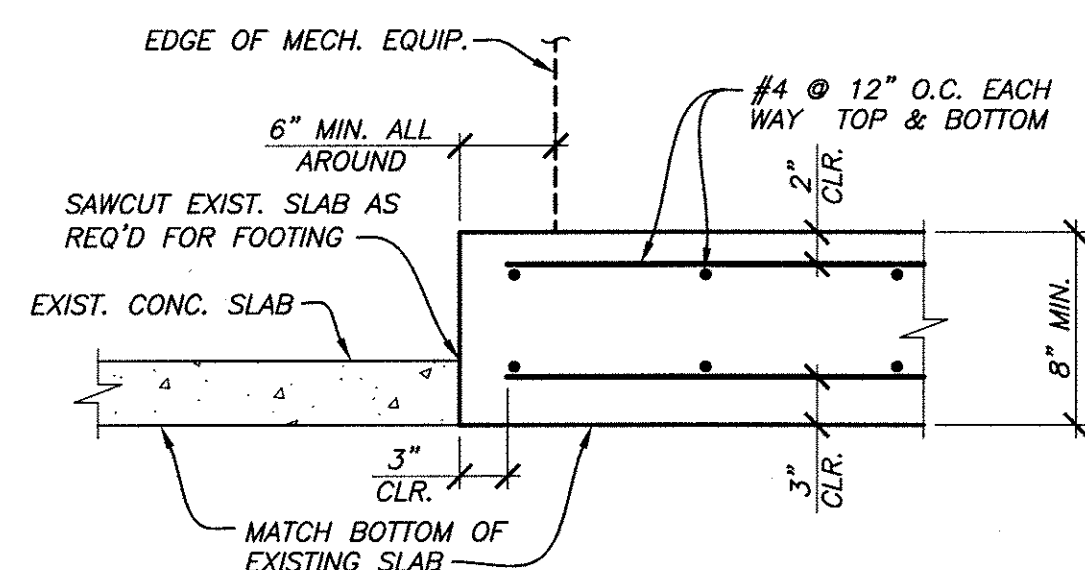
Special inspection is to be provided in addition to the inspections conducted by the Department of Building Safety and shall not be construed to relieve the Owner or his authorized agent from requesting the periodic and called inspections required by Section 109 of the International Building Code. The special inspector shall be approved by the City Building Official prior to starting work.

SPECIAL INSPECTION IS REQUIRED FOR THE FOLLOWING WORK:
(PER IBC SECTION 1704)

NON-SHRINK GROUT:
During placement of non-shrink grout. This inspection may be done on a periodic basis.



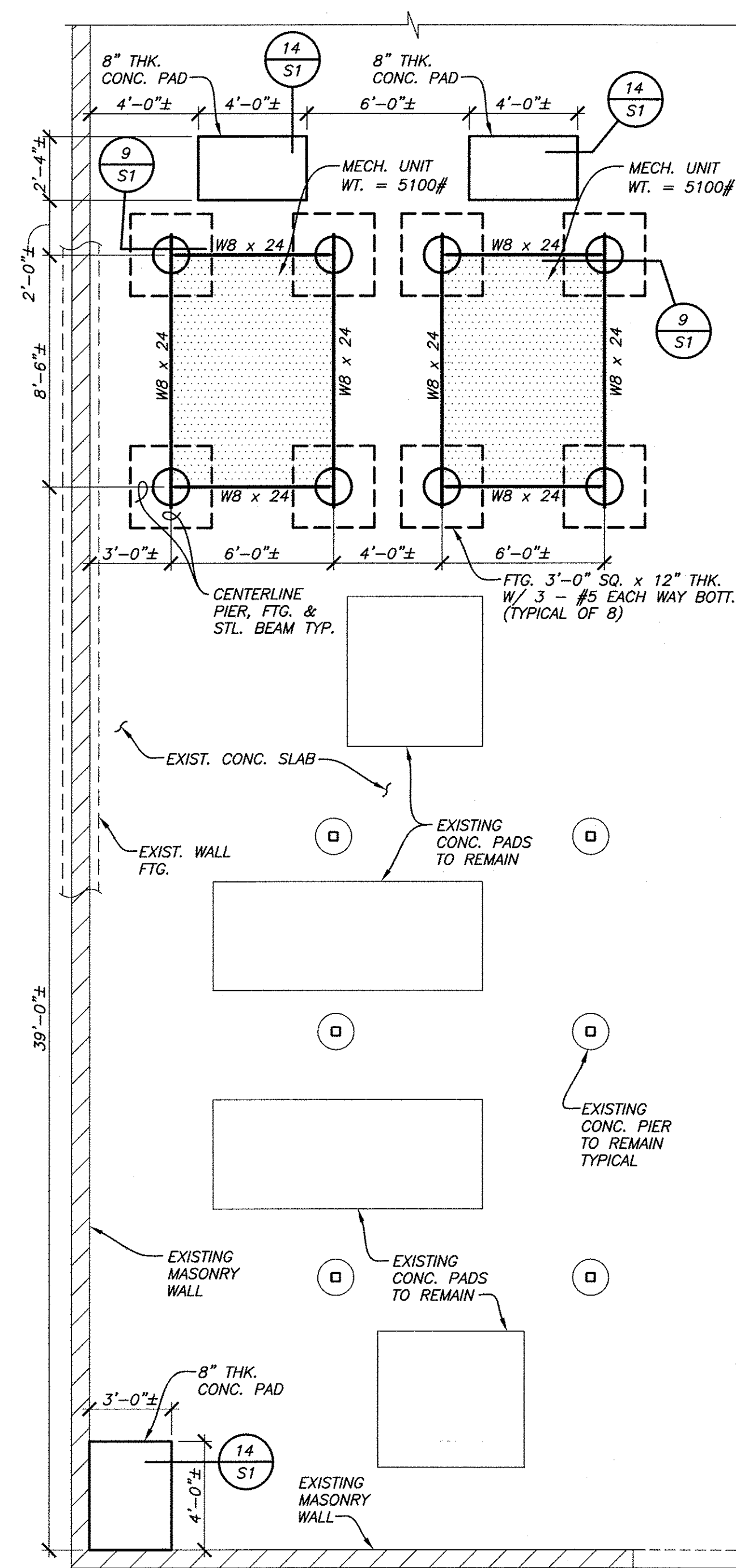
9 COOLING TOWER FTG. @ EXISTING
CONCRETE SLAB 1"=1'-0"



NOTES:

1. EQUIPMENT FOOTING TO EXTEND 6" MIN. BEYOND EDGE OF MECHANICAL EQUIPMENT ON ALL SIDES.
2. SEE MECHANICAL DRAWINGS FOR EQUIPMENT LOCATIONS.
3. PROVIDE ANCHOR BOLTS FOR EQUIPMENT AS REQUIRED BY MANUFACTURER.

14 MECH. EQUIPMENT SUPPORT FOOTING 1"=1'-0"



FOUNDATION NOTES:

1. SEE STRUCTURAL NOTES ON SHEET S-1.
2. AT EXISTING COOLING TOWERS REMOVE EXISTING STEEL FRAMING AND CONCRETE FOOTINGS AS REQUIRED FOR NEW FOOTINGS AND COOLING TOWER SUPPORTS.
3. SAWCUT EXISTING CONCRETE SLAB AS REQUIRED FOR NEW FOOTINGS AND PADDS. FOOTINGS SHALL BEAR ON FIRM, COMPACTED SOIL.

PARTIAL FOUNDATION PLAN  NORTH

[illegible]

LSW Engineers

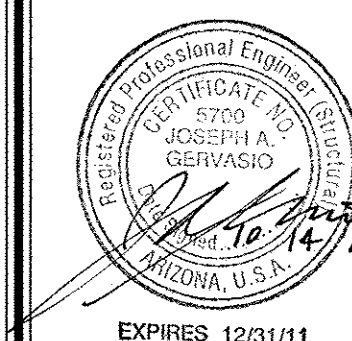


2333 West Northern Avenue
Phoenix, Arizona 85021
Telephone: 602.249.1320
Facsimile: 602.336.3276
E-Mail: lswpbx@lswpbx.com

PARTIAL FOUNDATION PLAN

**KYRENE de los LAGOS
ELEMENTARY SCHOOL**

17001 S. 34TH WAY
PHOENIX, ARIZONA 85048



DR. BY HLC	DES. BY RD	CKD. BY RD
DATE 10/11/11		JOB NO. 2011-097.000

SHEET NO.

S-1
OF

1 OF 1

GERVASIO & ASSOC. INC.

CONSULTING ENGINEERS
77 EAST THOMAS ROAD, SUITE 120
PHOENIX, ARIZONA 85012
(602) 285-1720

This drawing is an instrument of service. It is the property of GERVASIO & ASSOC., INC. and may not be reproduced or reproduction here of use without permission.